ON THE COVER

THE pioneer service station for motorists pictured on our cover was little more than a lean-to, but it started a rather enduring merchandising system. Today there are more than 200,000 stations, some of them elaborate establishments that sell a long line of supplies and services, not to mention soft drinks, cigarettes, and sundry other things. In contrast, the original unit, conceived by an employee of the Standard Oil Company of California and located in Seattle, Wash., sold only gasoline and oil. A gasoline dispenser, visible in the center background, was improvised from a kitchen-type water heater equipped with a sight gauge to indicate the level of the contents. The same company now offers its diversified products and extensive list of services and conveniences through 10,000 outlets.

IN THIS ISSUE

THERE has always been a close association between automobiles and compressed air, and it is continually growing stronger. Whereas air performed the one essential service of tire inflation for early cars, its applications since then have been greatly multiplied. Many of the tools and special devices that keep modern vehicles running right and looking smart depend on air power. Page 266.

•

DYED cloth owes the consistency of its color in large part to the ease of controlling air pressure. In modern textile mills the fabric, after traveling through a liquid dye, is squeezed between rolls. If the pressure varies, so does the color, and this used to happen when the rolls were loaded mechanically. Now, with instrument-controlled air on the job, the squeeze is always uniform and so is the color of the cloth. Page 272.

•

THE threat of fire has no terrors for Ashland Oil & Refining Company since it installed an effective, automatic foam-type protection system at its pumping station in Kenova, W. Va. It uses a protein-base foam that was developed in the Navy during World War II. Page 278.

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INTERMITTENT puffs of air have long served to blow soot accumulations off hot boiler tubes. Now the same idea has traveled down the temperature scale and is being put to work in a snow blower designed to keep railroad switches clear of obstructions in winter. Page 280.

Compressed Air Magazine

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EDITORIAL CONTENTS

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Keeping Your Car on the Road

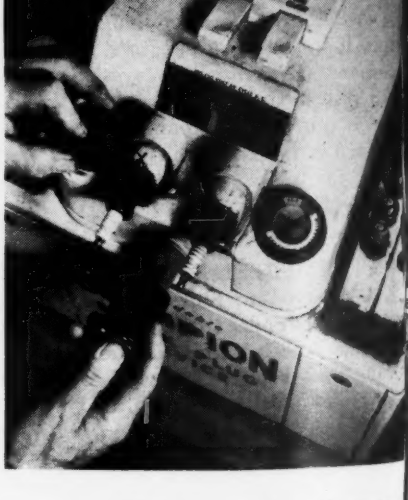
More than 200,000 Gasoline and Service Stations Minister to the Needs of U.S. Motorists

Robert J. Nemmers

IT IS reported that the first automobile "filling" station made its appearance in 1907. Prior to that time motorists bought gasoline at refineries and local general stores in 5-gallon tins. While watching a long line of impatient drivers waiting to purchase this canned fuel, an employee of the Standard Oil Company of California conceived the gasoline station. A 30-gallon tank—a refurbished water heater—was soon installed across the street from the Seattle, Wash., plant where he worked. It was equipped with a glass gallonage gauge, a hose and a simple hand valve so that gasoline could be delivered directly to the customer's tanks.

The idea mushroomed, and similar stations sprang up across the country. At first they sold only gasoline and oil, but soon began to handle car accessories, especially tires and fan belts which were among the most vulnerable parts of early autos. Tires were not the marvels of toughness then that they are now, and it was a common sight to see a perspiring, provoked and sometimes profane motor ist trying to inflate a tire with a blister raising hand-operated pump. Filling sta tions were naturally obliged to put in a compressors, and their owners eithe never gave a thought to charging for th air or figured that they could attrac customers by giving it away. In an event, it helped to stamp these roadsid establishments as "service" stations an made the public conscious of compresse air for the first time.

By 1952 some 200,000 stations in th United States were serving, with varyin degrees of completeness, the needs of th 43,810,531 passenger cars and 9,207,89



SPARK-PLUG CLEANER

Cleaning spark plugs used to be a tedious process of scraping, filing and sanding. With the aid of compressed air the job is now done thoroughly, and the plug is also tested in a matter of seconds. The spark plug is placed in the rubber-washered hole shown at the top of the picture, and the "Abrasive Blast" key is pressed. A jet of high-pressure air then shoots hard silica sand against the working surface, removing dirt, carbon and corrosion. Next the "Air Blast" key is operated, and any adhering particles of sand or foreign material are blown away. The same machine tests spark plugs by threading them into the ports at the front, as illustrated. An electrode is swiveled into position against each plug, current is switched on, and the small dial at the left is turned, causing a blast of air to simulate actual service conditions. The operator watches the plug reflected in the polished metal mirror and notes when it ceases to fire. At that instant he checks the pressure gauge at the right, which indicates the condition of the plug.

THE OLD ORDER CHANGES

The "free air" that service stations offered their patrons not too many years ago was used almost solely for inflating tires. Today, compressed air, still free for the asking, is the power medium for many important automotive maintenance operations.

trucks that traveled the nation's highways. Some were essentially sales outlets for gasoline, oil, grease, tires, and associate supplies; others included facilities for making mechanical repairs; and here and there was one also equipped to do bodywork. In every community of appreciable size, some or all these services were available in the agencies handling the various makes of cars. But, regardless of the size or character, it would be difficult now to find an establishment that is not provided with an air compressor.

Because they had to have compressors anyway, the early stations, as well as garage operators, began to look for more and more uses for compressed air. As a result, today's list of jobs performed by this adaptable power medium in the automotive maintenance field has grown to such a length and compressed air has proved to be such an efficient helper that tire inflation is now only one of its numerous important applications.

Let's take a look, for instance, at Bob Hess, Inc., Dodge and Plymouth dealer in Lancaster, Pa. There, as at other service stations, air for charging tires is still free for the asking—and you don't even have to buy gasoline. But inside the roomy (14,400 square feet) hangarlike building where the company does all its servicing and repair work you can see compressed air performing so many tasks that it is little wonder the mechanics consider the outside tire-inflation hose almost insignificant.

In the service department are five pneumatic car lifts, three of them 2-post units that make it possible to elevate cars to whatever height may be necessary to give mechanics easy access to all underparts. The lifts, including one that is used exclusively for undercoating, are in well-nigh continual demand. The entire lubricating system is air operated: oil is pumped by air to each of the four "lube" posts and grease guns for chassis lubrication also are of the pneumatic type. Four guns can be utilized at the same time, thanks to the large air supply available.

In addition to the repair shop, Hess's maintains a small paint and body shop that is kept busy rolling out bumps, dents and ripples which always seem to appear in fenders and grilles. There, too, compressed air is much in evidence powering equipment to be described later. Two Ingersoll-Rand air-cooled, 2-stage units, each discharging at 150 psi pressure, furnish the air required for the station's myriad operations.

To protect the tools, all air lines are provided with Alemite moisture traps. Ordinarily, one compressor meets the needs of the service department; the other one those of the paint and body shop. When undercoating is being done, however, both machines are drawn upon because the spray gun by which it is applied consumes more air than any other tool commonly used in automotive shops. The Pneumatic Automotive Equipment Association reports that undercoating guns require an average of 19 cfm at 70 to 100 psi pressure, as compared with 16.5 cfm for the next largest air consumer —the air hammer such as is found in body shops. This explains why the compressors at the Hess station are interconnected by a suitable arrangement of valves. In this way it avoids closing

TIME-SAVING TOOLS

The manager of a Tulsa, Okla., service station watches (above) as a mechanic tightens cylinder-head bolts with an Ingersoll-Rand Impactool. Previously, by hand methods, a valve-grinding job in this shop took 3 hours, 20 minutes. With the power tool it has been cut to 2 hours, 25 minutes, and operator fatigue has been virtually eliminated. The mechanic shown at the right is starting to remove the cover of the rear axle housing preparatory to replacing the ring gear and pinion assembly. With hand tools, the job required 4 hours, 40 minutes; with the new power tools it takes only 3 hours, 25 minutes.

down other work while undercoating is going on.

Undercoating consists in spraying a thick, gummy compound on the underparts of a car. Generally, one application is sufficient to protect the metal for life against damaging corrosion. This is especially important in northern latitudes where many state-highway maintenance departments treat icy roads with chemicals, some of which, unfortunately, are highly corrosive and will, if picked up by moving cars, eat away metal surfaces exposed to their attack. In addition, the compound serves to lessen body noises, and for that reason the underside of the hood and trunk cover also are usually coated.

One piece of air-operated equipment at the Hess garage that invariably attracts the attention of visitors is the Walker Rocker-Jack. At the base of this unit is an air cylinder from which extends a rod that is brought in contact with the frame of the car on the lift. With each shot of grease applied, the device receives a shot of air. This rocks the vehicle, relieving pressure on the parts the grease is intended to reach. Before the introduction of this air jack, pressure on the moving parts of heavier cars and trucks was relieved by hand prying with a steel bar which often slipped, bruising knuckles and sometimes damaging the vehicle.

Hess's service department handles an average of 25 cars per 8-hour shift, the work ranging from minor jobs to major repairs and complete overhauling. To help cut down the time mechanics spend loosening and tightening nuts, it is provided with pneumatic Impactools, and the countless drilling and reaming jobs are performed by two ¼-inch Multi-Vane air drills.

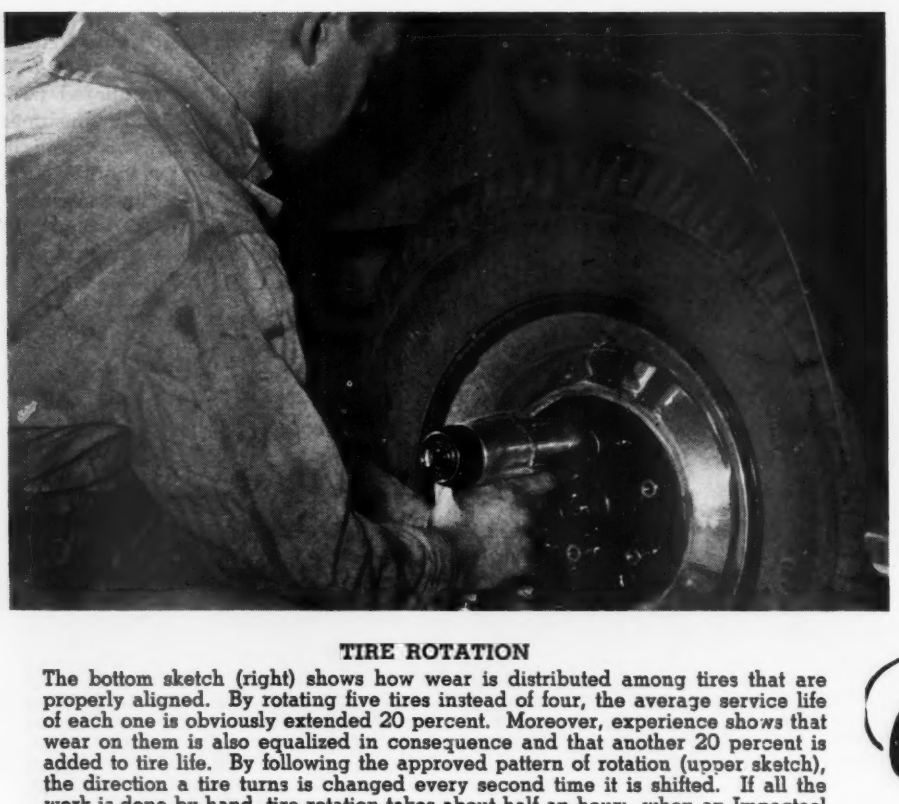
Impactools, which apply more than 2000 powerful rotary blows per minute, are especially helpful in removing frozen nuts. They are popular with the men because the torque developed is not transferred to them, and with shop owners because they are a means of increasing profits through speed of operation. Electrically powered tools with the same impact mechanism also are available, and records kept by the Midwest Chevrolet Corporation, Tulsa, Okla., show how they make it possible not only to save time and money but to improve employee and customer relations as well.

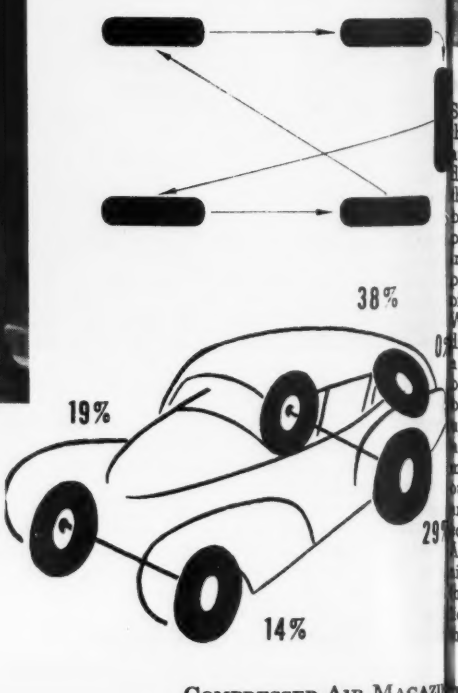
In the Midwest shop the shift from hand to power tools was started by one mechanic who bought an Impactool for his own use. When three more men followed his lead, the management went along with them: it reimbursed the four who had spent their own money and purchased twelve more, thus providing one for each of the thirteen service bays, the lubrication rack and the warehouse, as well as a spare to be kept ready for service in the stock room.

A comparison between March, 1950, and March, 1951, gives an idea of the over-all effect of the use of these new tools. Shop work, in terms of flat-rate hours, jumped from 2507 to 3254 hour with a resultant increase in revenue $2614.50. As the labor force remain constant (thirteen mechanics) throug out both periods, and as other servi facilities were not changed, the compan attributed the upward swing entirely t the Impactools. Both Midwest Che rolet and the mechanics shared in th added income: the latter's average pa rose from $290 to $375 per month f the same number of hours worked, an the company's added profit amounted t $1509.50, or almost enough to cover th cost of the tools.

Good employee relations were ind cated by the fact that the thirteen m chanics who were in the shop in 19 were still there in 1951. This, in a fie of exceptionally high labor turnover, al was credited to the Impactools not onl because they enabled the men to ear more wages that combated the lure o other jobs but likewise because they re duced fatigue to a minimum. As to cus tomer relations, motorists like the faste better service offered by Midwest an help to advertise the garage by word o mouth.

One job on which Impactools show u to advantage is that of tire rotation, simple method that makes it possible increase the mileage of a set of five tir by about 40 percent. It is explained connection with accompanying illustr tions. Impactools have made the oper tion so much easier than it used to that employees are sometimes observe "selling" this service to customers their own volition. Don R. Howe, ma ager of Carl Grady's Richfield Servi Station in Los Angeles, Calif., found th to be true. Obviously, it is good busine for shop owners to provide their worke with these labor-lightening tools. A other operator, Stokes McGraw, wh





TIRE ROTATION

The bottom sketch (right) shows how wear is distributed among tires that are properly aligned. By rotating five tires instead of four, the average service life of each one is obviously extended 20 percent. Moreover, experience shows that wear on them is also equalized in consequence and that another 20 percent is added to tire life. By following the approved pattern of rotation (upper sketch), the direction a tire turns is changed every second time it is shifted. If all the work is done by hand, tire rotation takes about half an hour; when an Impactool is used to run the nuts, as illustrated above, it can be done in ten minutes.

ns a Richfield station in nearby Hollywood, estimates that an Impactool saves 5 percent of the time on tire rotation. ecause his shop is called upon to do a ariety of work, he uses the electrically owered model for that purpose, as well for muffler replacement and other odd bs.

Aside from its other increasing applitions in service stations and garages, ompressed air still plays a big part in e tire business, especially in connecon with retreading. When a tire is rought into the Coble Tire Service in ancaster, Pa., for example, it is first inpected by placing it on an air-operated preader which makes it easy to see the ost minute cracks and blemishes on the side of the casing. For this purpose

AUTOMOBILE LAUNDROMAT

The Washmobile is an air-operated semiautomatic machine that bridges a car and directs a series of jets of water and detergent against it from both sides and overhead. The steel frame runs on tracks mounted on the floor on each side. A large stationary tank holds the water under 160 psi air pressure. An additional reservoir automatically replenishes the supply in the first one as it is used, assuring a steady volume at the jets. The detergent for the washing operation is fed from a tank that is mounted on the bridge and is also under pressure. The flow is shut off for the clear-water rinses. A hand-held nozzle serves to clean wheels and other parts out of reach of the jets. For cold-weather drying, a hose discharges compressed air to hasten evaporation. Under normal conditions, the Washmobile, manned by one employee, can wash a car in fifteen minutes, exclusive of drying time.

UNDERCOATING

praying a thick, gummy compound on he unpainted metal undersurfaces of utomobiles reduces corrosion and subdues road noise. In the illustration, he compound is being drawn from the barrel, in the background, that is especially equipped with a unit consisting of a pump, manually controlled pressure valves, pressure gauges, a set of accumulators and hose couplings. When the unit is placed on the opened drum, a feed pipe extends down through a loosely fitting cover nearly to the bottom of it, and the pump, operated by compressed air, forces the coating up through the pipe and a hose connection to the spray gun. The accumulators, on top of the barrel, even out pulsations imparted by the pump and maintain constant pressure on the compound to keep it flowing smoothly. At the spray-gun nozzle, compressed air at about 40 psi pressure breaks up the material into relatively fine particles that are distributed uniformly on the car's undersurfaces.

Coble uses a Ke-Hawke tire spreader and, to aid in handling larger tires, a hoist actuated by a pneumatic cylinder. If inspection indicates that the tire is worth retreading, it is then subjected to a series of treatments, many requiring compressed air, to give it new life.

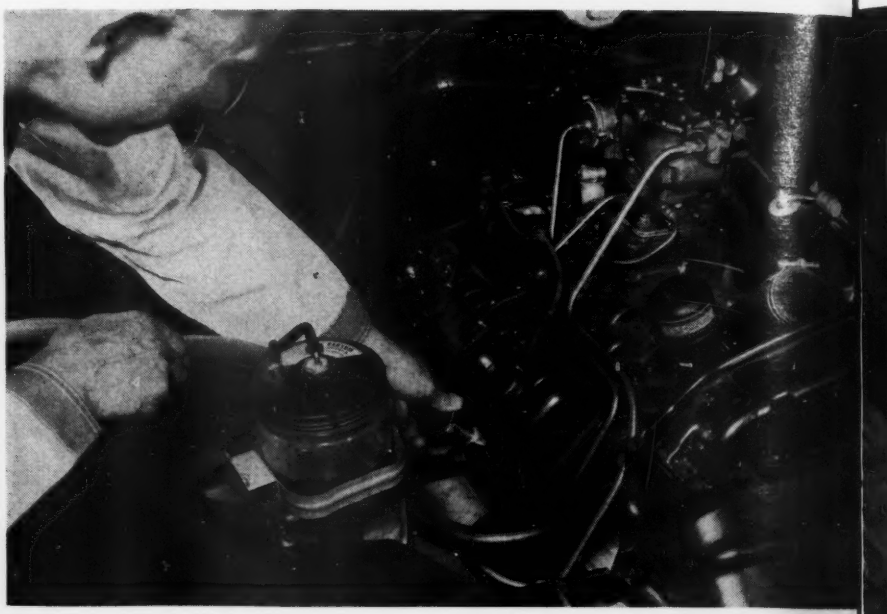
First the tire is buffed to roughen the outer surface—give it "teeth"—so it will hold the special cement with which it is next coated. This is followed by rolling a strip of new rubber over the cement along the outer periphery. Then a heavy tube is placed inside the tire and inflated to facilitate handling it during subsequent operations. These involve inserting a heavy metal curing rim into the tire, putting the assembly into a molding machine, clamping it securely in place and applying steam and compressed air at 150 psi to the matrix to form the new tread. Curing time may take about 100 minutes, but depends, of course, upon the size and type of tire. The air is furnished by two Ingersoll-Rand 2-stage compressors—a 10-hp and a 5-hp unit—which are interconnected to assure an adequate supply. By taking full advantage of modern pneumatic equipment, this shop, with only eight people working 8½ hours, processes daily about 40 passenger tires and 12 truck tires.

Proper care and maintenance of the compressor plant is recognized to be a vital factor in obtaining clean and reasonably priced compressed air. Lincoln-Mercury Company at Lancaster, Pa., uses two I-R 2-stage machines, each powered by a 5-hp motor, to provide air for ten grease guns, two air-operated hydraulic hoists and for undercoating cars. The units are located in a well-lighted, well-ventilated basement, and both to protect them and the employees are surrounded by guard rails made of heavy piping that can be quickly uncoupled to give access to them. They are set to cut in at pressures 5 pounds apart—the first when the pressure in the receiver drops below 150 psi and the second when the pressure drops below 145 psi. About once a year the pressure-cut-in settings are exchanged so that each compressor will get approximately the same use over a period of time. They are lubricated and inspected at regular 2-month intervals, the dates of inspection and of oiling being entered on service tags attached in a conspicuous place on the machines.

Car washing by modern means is another service of importance to good customer relations and to station operators because of time-saving, on the one hand, and prevailing high wage rates, on the other. At the Norton Esso Station in Phillipsburg, N. J., the work is done with dispatch by what is known as a Washmobile. This ingenious machine directs high-pressure streams of water and detergent onto the car, softening up road film for easy removal with sponges. It is

CLEANING WITH RICE

Below, a service man exhibits a handful of the short-grain rice that is used to remove carbon from the combustion chambers of automobile engines with the "Head-On" blaster developed by Oldsmobile engineers. Propelled by air at 40 to 60 psi pressure, the rice thoroughly, quickly and inexpensively cleans the combustion chambers. The unit holds from 10 to 20 pounds of rice, which is forced through the lower plastic hose into the combustion chamber and drawn out by the upper hose and back into the machine. The mechanic pictured at the right has removed a spark plug from an engine cylinder and is inserting the nozzle of the blaster into the opening. By moving the nozzle tip around inside the chamber, he can attack all parts of it.



mounted on tracks and moves back and forth the length of the automobile as the job progresses. Water for the sprays is boosted to about 160 psi by compressed air in a 2-compartment tank. Operation of the fill-discharge cycle is automatic, water being drawn from the station's normal supply. The detergent is introduced into the spray system through a small hopper arrangement and automatic valve.

William Norton, owner of the station, says that the equipment has increased this phase of his business. "In the first place," to quote him, "it keeps the men dry—if it didn't we couldn't hang onto our experienced help. Next, it speeds up the process, we wash a car now in about 15 minutes as against about half an hour by handwork. And the high-pressure sprays really get the cars clean. Our customers think so, too, and on top of that the Washmobile is a real attention getter when functioning. The other day a driver from Oklahoma, in here for gas, saw a car getting cleaned up and decided to have his washed. There's been a lot of cases like that."

Another handy device at the Norton station improves the performance of the air intake filter on the carburetor. It is a Vulcan cleaner, a basinlike receptacle about 3½ feet high mounted on a small stand. In operation, a high-grade commercial solvent is poured into the basin, the filter is dropped in, a lid is fastened down, an air line is attached and a valve is opened. The air causes the solvent to "boil" up through the filter, reaching all surfaces. When the filter is clean, the air hose is removed, the solvent is drained from the receptacle, and the hose is connected to a lubricator valve. Through the action of the air the oil is atomized (much as in a pipe-line lubricator) and carried to and through the filter, coating its surfaces with a dust-trapping film.

The number of pneumatic devices used in service stations and in garages is so great that it is impossible to describe them all. There are two, however, that should be mentioned because they save considerable time and effort. One is the carbon blast by which carbon is removed from the combustion chamber of an engine without taking off the cylinder head. Engineers had long sought something of this kind because the abrasive blast previously resorted to was much too harsh for the purpose. Engineers of the Oldsmobile Division of General Motors Corporation finally came up with the answer —common household rice of the short-grain variety. It is amazingly effective in getting rid of the carbon deposits, yet there is no danger that the highly polished inner surfaces of the engine will be harmed in any way.

By the newer method, the spark plugs are removed and compressed air shoots the rice into the combustion chamber through the spark-plug holes. When the work is finished, the rice and carbon are withdrawn from the chamber through a hose by suction. Many stations treat spark plugs in a similar manner except that the abrasive in this case is silica sand. It's a much faster and a much more thorough process than laborious hand scraping. Some of these machines incorporate apparatus that determines the condition of the spark plug at the time it is being cleaned.

No story concerning compressed air in the automotive maintenance field would be complete without some mention of bodywork and painting. Although the spray gun came along in 1892, it was not used widely until the technique of mass production was introduced in automobile plants. Along with the large variety of other air-operated tools and equipment, paint-spray guns are now vitally important to body shops specializing in car repainting.

Take, for example, Roy Stauffer, Inc., garage and service station at West Pittston, Pa. Stauffer completely repaints any make of car for considerably less than is usually charged elsewhere even though he uses the highest grade of materials and first-class workmanship. The secret (if it is a secret), according to Carmen Pizzano, body-shop superintendent, lies in the fact that the organization hires the best available mechanics and makes a conscientious effort to keep them happy and contented so they will stay with the company, thus avoiding expensive labor turnover. In addition, about 95 percent of the operations in the paint shop are air-powered, thereby bringing down labor costs.

An automobile brought in for repainting is put on a production line where it is attacked by a crew of skilled body and fender mechanics, most of whom use pneumatic tools of one type or another. First, live steam is applied to remove dirt from the motor and chassis so as to prevent it from being blown back on to the painted surface. Then fender and body damage is repaired. At this stage special air-operated fender-straightening equipment is often used.

To insure a smooth surface and perfect

FENDER-STRAIGHTENING

Air-operated hammers make quick work of smoothing out rumpled fenders, their pistons striking hundreds of blows per minute. On the other side of the fender undergoing straightening is a steel anvil that backs up the hammer blows. It is held in place by the tubular steel yoke that is attached to the air end of the tool and loops around under the fender. The shop in which this picture was taken also attaches a panel-cutting device to one of its fender hammers for salvage work.

bond for the new paint, the car is chemically cleaned to remove wax, tar and road film. Then the whole surface is gone over with an air-powered block sander to take off loose paint and rust. Those areas that are inaccessible by other means are cleaned by sandblasting. To keep paint off windows and chrome fittings, they are covered with paper and masking tape. Then all crevices are blown out by use of a high-pressure air jet so that no hidden dust remains. Pits in the old finish that can't be obliterated by sanding are filled in with lead and then polished to a smoothly blended featheredge with pneumatic sanders. Bare metal is sprayed with a coat of priming paint that dries rapidly. Finally, the car is dusted with a high-pressure blowgun and wiped with a special tack rag to make sure that it is absolutely clean.

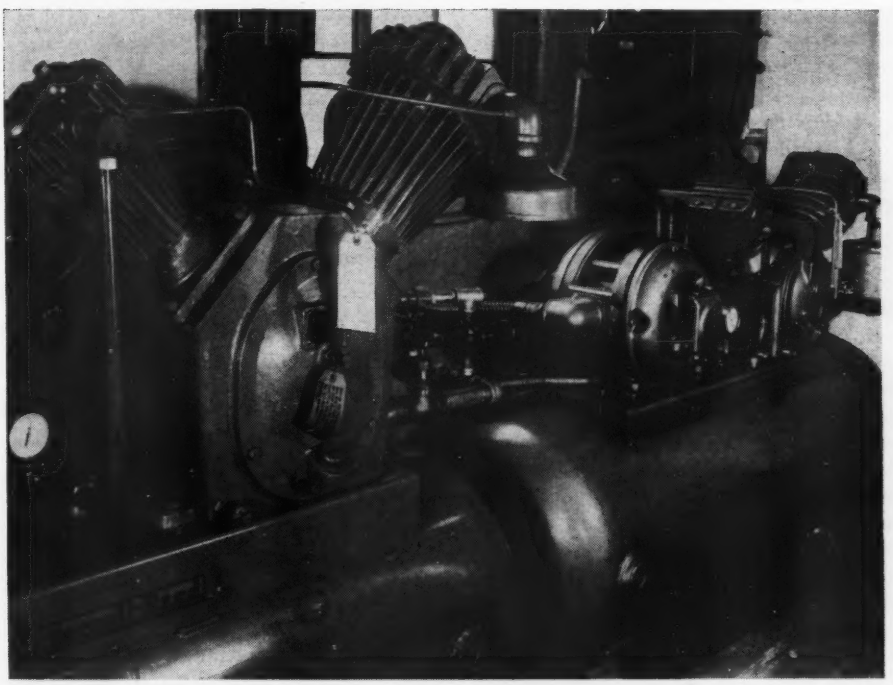
Now the vehicle is taken to an enclosed, dustproof paint booth where any remaining particles of dust are flicked off and a quick-drying enamel is applied. Stauffer's uses a factory-type spray gun that, roughly, dispenses twice as much paint as an ordinary gun. Then the car is moved into an adjacent booth housing an Auto-bake machine mounting banks of infrared lamps that bridge the body. During the baking process the Auto-bake travels slowly back and forth on tracks so that the rays penetrate the entire surface, thus insuring even, complete drying of the paint.

After the repainted car leaves the baking booth, the masking tape is quickly stripped off, the newly polished chrome fittings are replaced and, in a matter of hours, a once dull and weather-beaten vehicle emerges from the shop as bright and shiny as a new one. So well trained are Stauffer's men and so efficient are the air-powered tools used that an average of twelve cars can be reconditioned in an 8-hour shift.

Compressed air for the paint-spray operations and the other applications around the shop (Stauffer's maintains grease pits and service facilities much like those previously described) is supplied by an Ingersoll-Rand 2-stage, 15-hp Type 30 machine mounted on a 16-cubic-foot receiver. Pneumatic tools are utilized as much as possible because of their low maintenance cost and trouble-free operation, and air outlets are provided for them everywhere throughout the shop. Air-line lubricators keep them running smoothly, obviating periodic stops for oiling, and moisture traps in the lines keep condensed water vapor from reaching the tools.

A unique feature of the Stauffer establishment, which employs 50 people, is a cafeteria in the center of the shop where free lunches are served to all. And during rest periods, the men go into the cool, quiet room for a cup of coffee or a light snack. There, too, customers for the new and used cars sold by the concern can talk shop with the salesmen, or, if they wish, just loaf while waiting for their cars to be repainted, repaired or serviced.

Effective automotive maintenance revolves around the skilled mechanic who, today, is thoroughly familiar with the functioning of a car and is paid accordingly. By putting power tools into his hands to relieve him of such a tedious and time-consuming chore as hand wrenching, management permits him to apply his knowledge to more work in a given period of time. Three parties benefit: the customer, whose car is fixed faster, better and cheaper; the employee, whose wages generally go up in direct proportion to the number of jobs he performs; and the employer, whose profits rise.



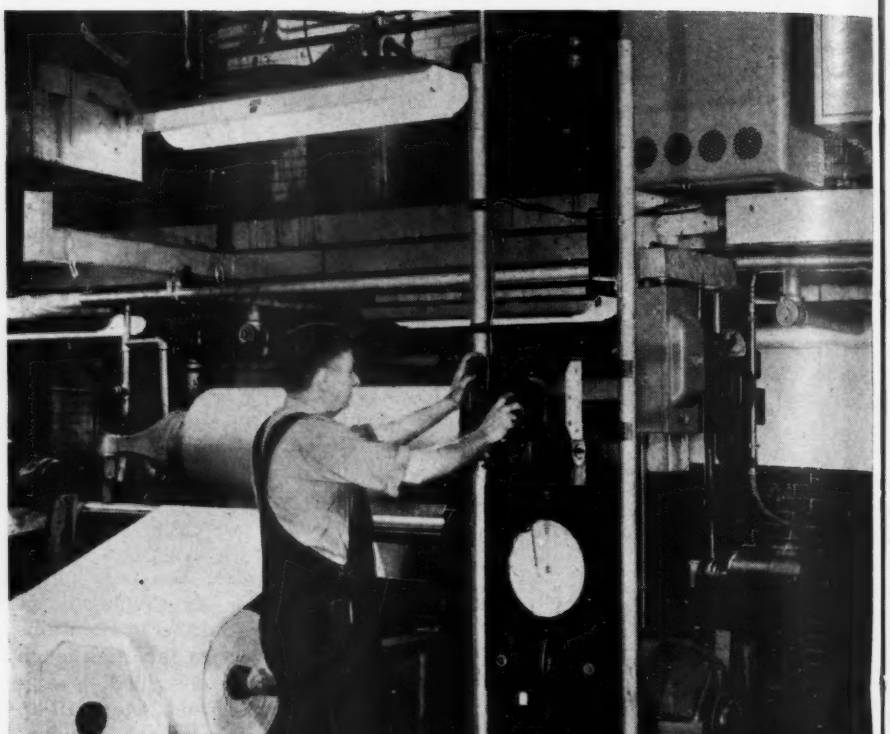
SERVICE-SHOP COMPRESSORS

The accepted compressor for gasoline filling stations is an air-cooled machine driven through V-belts by an electric motor mounted on the air receiver. Similar but larger units generally supply service shops. The two Ingersoll-Rand Type 30, 2-stage compressors pictured furnish air at 150 psi pressure for the inspection, repair and retreading operations of Coble Tire Service, Lancaster, Pa. The one on the left is a 10-hp machine; the other, a 5-hp unit. Between the two can be seen the valve connections that enable the compressors to be used singly or together, depending on the shop's varying air demands. The machines are inspected and lubricated at regular intervals, the dates being recorded on tags attached to them. A big, typical service station requires air at pressures ranging from 20 to 175 psi. The average consumption of free air differs with the tool or equipment and runs from ½ cfm for a spark-plug tester to 19 cfm for an undercoating spray gun.

Air Makes a Blue Shirt Blue

Pneumatic Roll Loading Has Made Dyeing of Fabrics Much More Accurate

W. H. Ridley*



DYE-PADDING MACHINE

After being immersed in a liquid-dye bath, the fabric is squeezed between two rolls in the background with pressure that is kept uniform by pneumatic loading and controlled at the panel shown. The picture was taken in the modern dyehouse of Riegel Textile Corporation at Ware Shoals, S. C.

AIR pressure, harnessed and controlled, is one of the powerful muscles of industry. It can push or pull, press or lift. It can exert any desired force in any desired direction, and when this power is used on roll-type machinery, the application, known as pneumatic loading, is a short cut to better, faster production.

Pneumatic loading, now common in many establishments, is standard practice in the case of most machines using squeeze rolls. But, like everything else in the industrial world, it has made great technological strides and is continuing to progress. It is interesting to examine these developments as they affect the textile industry where air loading of roll-type equipment helps mills to turn out better cloth.

Consider, for example, a man's blue cotton shirt. When the manufacturer buys his cloth from the mill, he wants the right shade in every bolt. Blue is a problem in itself—a difficult color to handle. Yet the blue must not vary from yard to yard or bolt to bolt. So, it's up to the dyehouse to produce blue cotton fabric that meets the maker's specifications and pleases the customer. To do this most dyers use the relatively new continuous process by which clean white shirting, 37 inches wide, speeds through a machine known as a dye padder.

Traveling on rollers, the material is immersed in a liquid-dye bath and then squeezed between two rolls which not only remove excess liquor but also help the dye to penetrate all the fibers. Air pressure is applied to these rolls so that the entire width of the cloth is squeezed equally. Thus the fabric retains the same percentage of dye throughout and emerges a uniform shade of blue. Moreover, the dyer cuts down rejects and saves dye and production time.

As it continues to go through the plant the cloth is subjected to chemical dips and squeezing, washing and squeezing, rinsing and squeezing and drying. These additional squeezes, while not as critical as that in the dye padder, are very important. If the dye in the chemical baths should be reduced or oxidized unevenly, the material can easily be thrown off-shade. But in each instance, carefully regulated compressed air insures the uniform squeeze which is the main color governor.

The system by which the air is directed to the rolls is a simple one. From the mill's compressor it goes to a pressure regulator and then through an air switch to cylinders or diaphragm motors that control a leverage device on the rolls. Indicating or recording instruments show the working pressure. By observing the instrument panel and adjusting the regulator the operator can automatically maintain the desired load with precision. The switch applies compressed air either to the load or the lift side of the cylinders, thus permitting the roll to be loaded or lifted pneumatically. With all the pneumatic loading controls mounted on a panel within easy reach, it is possible to make the quick adjustments necessary for high speed, continuous operation. Since thousands of yards are being dyed per day, it would be comparatively easy to spoil a large run if these controls were complicated or inaccessible.

*Textile Industries Division, The Foxboro Company, Foxboro, Mass.

The maximum loading pressure, while rarely used, may be as great as 500 pounds per linear inch of roll face (60-inch-face roll set at 15 tons). Even at the 15-ton load the pressure is usually not more than 60 psi so that the air is still compressible and will cushion the blows from seams and foreign matter passing between the rolls. Better cushioning is obtained at the customary pressure of from 30 to 40 psi, which is approximately the same as that in an automobile tire.

Having this force available, the operator can apply any loading pressure needed to obtain the proper pickup for the particular dye formula being used in the pad box. Furthermore, because each top-roll bearing is usually loaded independently, a 2-pen pressure recorder is generally utilized instead of dual indicators to register load changes and keep track of variations resulting from normal wear on equipment.

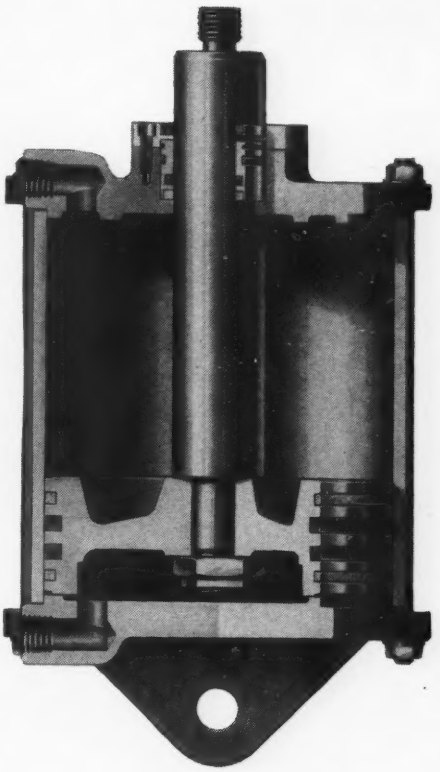
The vital element in the roll-loading system is the cylinder operator. It must be tight enough to prevent air leaks and free enough to avoid friction. If the packing is too tight, the piston cannot slide easily within the cylinder bore. Then, too, if the piston stays in one place for any length of time its "break away" may become jerky and slow—it may respond poorly to the small air-pressure changes of roll loading. Corrosion must also be considered, because excessively moist air will pit ordinary metal and destroy the cylinder.

The Foxboro Company, recognizing these special problems, undertook the job of designing a cylinder operator exclusively for roll loading. The work involved four stages of development extending over a period of fifteen years. The first cylinder, produced by Hannifin Corporation according to Foxboro specifications, had chromeplated cylinder walls, piston rods and nuts and its packing was of the adjustable type. A second model, with a honed and polished cylinder bore, further reduced friction, but the difficulty of adjusting the packing remained. This led to a third development—the leather cup type of packing which rode the smooth cylinder walls and cupped the air pressure which drove the piston. While it did overcome excessive leakage, it caused still more friction. Six months later, in 1950, these problems were solved with the Stabiload cylinder which, for the first time, provides a loading device virtually free of both friction and leakage.

The excellent performance of the Foxboro Stabiload cylinder is largely attributable to the Block V seal packing in the piston and the piston-rod packing gland. The seal is a precision-molded, continuous ring of Hycar compound (a special synthetic rubber highly resistant to oil and chemicals) with a cross section shaped like a blocked V. It is inserted in the annular grooves in the piston so that the open end of the V faces the air pressure. The rugged design of the ring is such that the air forces only the lips of the V against the cylinder walls. Thus the small area of contact between packing and walls cuts friction to a minimum, yet provides a near-perfect seal. The construction makes for a leakproof cylinder that operates with negligible wear on its components and packing.

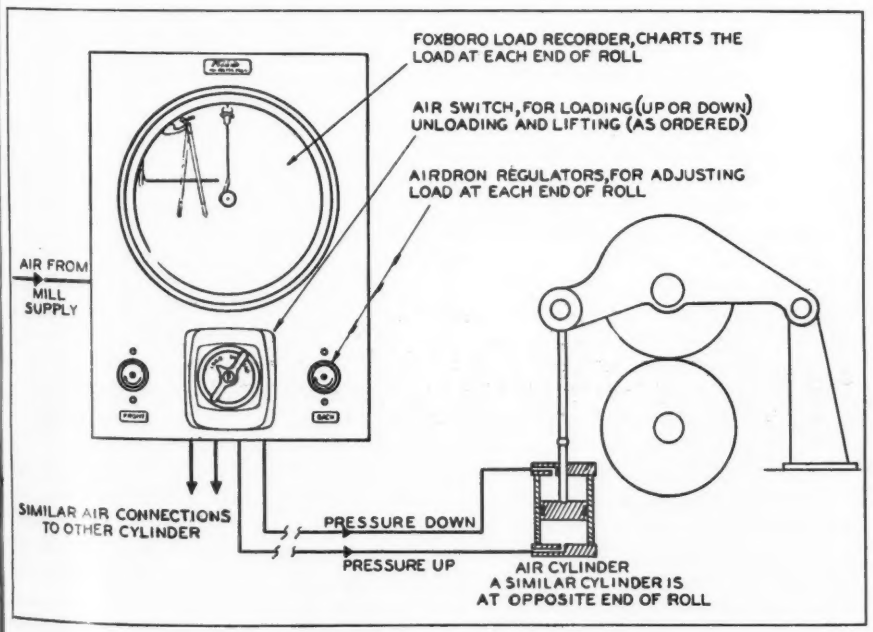
Another advance in pneumatic loading is the diaphragm air motor that serves to position a control valve. While not used to any great extent on dye padders, it is one of the basic loading devices in other phases of textile processing. The unit is connected to the compressed air supply through the customary regulator and air switch, but instead of working through a leverage system usually applies its force directly to the top roll because the length of its stroke is limited (1⅜ inches maximum, on the most popular size). It is capable of applying as much as 5 tons of loading pressure and has the added advantages of economy, low friction and no leakage. Where applicable, the diaphragm air motor is by far the most efficient roll loader.

To load the rolls, air is switched to the motors, which contain sturdy coil springs by which the top roll is suspended. The air strikes the diaphragms, thereby compressing the springs and lowering the top roll until it comes in contact with the fixed bottom roll. From that instant all air pressure is converted directly into total load, with virtually no loss through friction. And with the dead weight of the top roll nullified by the springs, actual loading starts at zero pounds. To raise the roll, the air switch is turned to "lift," air is vented from the motors and



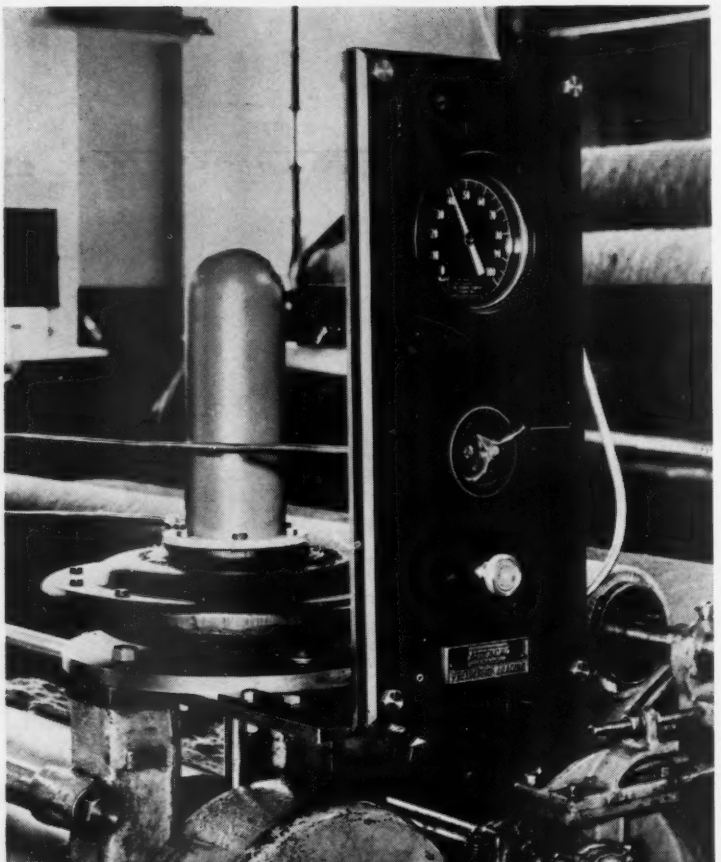
LOADING CYLINDER

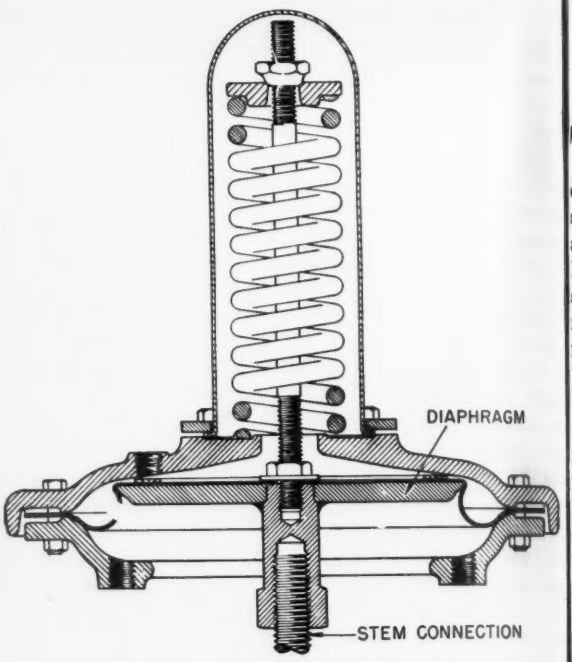
Cutaway view of a Foxboro Stabiload cylinder that applies the pressure on the padding machine pictured on the preceding page. Air enters through ports either at the top or bottom left, depending on whether the roll is to be loaded or lifted. Rings of Hycar compound of blocked V shape barely touch the cylinder walls and cup the air pressure, minimizing both leakage and friction.



HOW ROLL LOADING WORKS

Schematic diagram of a Foxboro pneumatic system for loading the squeeze rolls of a dye-padding machine.





AIR-MOTOR LOADING

Air motors are sometimes used instead of cylinders. The picture at the left shows a Foxboro Stabilflo motor on a Peralta machine. The gauge at the top of the panel indicates the pressure applied, and the switch in the center directs the flow of the air so as to load or lift the top roll. An identical air motor is at the opposite end of the roll and the two are manifolded to keep the pressure equal. Above is a cross-sectional view of the motor. Air introduced in the bell forces the diaphragm and the connected stem down. When the air switch is turned to "lift," pressure is released and the spring raises the roll.

pressure on the coil springs is released.

Contrast this tremendous loading pressure, applied pneumatically by the flip of a finger, with the back-and-brawn loading of earlier days. Then most rolls were weight-and-lever operated, some had screw-down devices, and others a combination spring-and-hydraulic system. Each had its drawbacks, but the weight-and-lever type was the most popular. It required an operator who was both powerful and agile, and patient as well. His job was to put weights on the levers that ranged from 15 to 25 pounds and sometimes as much as 50 pounds each. There were times when the weights should have been removed, but, being accessible only from the back of the machine, were left in position even during shutdown periods. Heavy pressure, if exerted for any length of time, tended to make a flat place on the rubber covering. With air loading, the turn of a switch vents the load.

The size of the weights brought about another disadvantage, for 25 pounds, through the compound lever system, often became 400 to 500 pounds—hardly a precision adjustment. In converting such a machine to pneumatic loading, the bottom lever is generally removed and the cylinder is installed in the pull-rod. This eliminates errors caused by friction in the leverage system and permits the pressure to be adjusted in fractions of a pound instead of 25-pound steps.

There was no loading system then (nor is there one now) that prevented rolls from becoming out-of-round. After a period of service, rolls develop eccentricity, if only a few thousandths of an inch. The loading force then varies considerably with each revolution of the roll, and at normal operating speeds weights cannot compensate for these variations. However, in the case of pneumatic loading, air acts as a cushion, absorbing the effects of roll eccentricity.

In the screw-down type there was no cushioning at all, even less than in the weight system. To load the rolls, the operator turned a large adjusting wheel and thus virtually locked the rolls in place. If a wad of material or an especially heavy seam passed between them it caused a variation in the loading force that damaged if it did not break the machine. As to the practicality of repeating a certain loading pressure, such a feat was impossible or, if accomplished, purely accidental because the operator simply attached a length of pipe to the wheel and gave it a good heave.

Pneumatic loading, by its very nature, presents none of these difficulties. Rolls are instantly loaded or unloaded from the switches at the panel, the operator remaining a safe distance from equipment and fluids. Adjustment is precise; dye penetration accurately controlled. Pressure at either end of the roll can be increased to compensate for drive gears or any other causes of inequality in the "nip." Uniform dyeing is easily obtained, because any previous setting can be exactly reproduced. Further, by making it possible to apply greater pressures than by the older methods, the pneumatic system lets the dye padder operate at stepped-up speed, thus increasing production and permitting the use of a higher dye concentration to get the same pickup with less water carry-over.

Emerging from the final drier, our once white cotton cloth is now the exact shade of blue the shirt manufacturer specified. As we have discovered, air is the means and the muscle, powering the firm but gentle squeezes required not only during dyeing but all along the route as cotton is converted from raw fibers to gray goods and, finally, to the finished fabric. As many as 100 such squeezes are involved, and whether the end product is a blue shirt, a pink sheet or pillowcase, a yellow towel, or a green tablecloth, it owes its color to improved chemicals and machine design, dyehouse skill, and the scientific application of compressed air.

Impactools Cut Tank Erection Costs

THE use of Impactools by Mill & Elevator Service Company in the erection of bolted steel tanks for grain storage has cut 150 man-hours from the average job and saved the Des Moines, Iowa, firm more than $7000 in the construction of 25 such tanks. The latter range in diameter from 9 to 38 feet and rise to a height of 56 feet, the average being 21 feet in diameter and 48 feet high. All, regardless of size, are built of standard 7- to 14-gauge steel sheets measuring 4½x8 feet. These are fastened together with bolts—48 vertically in each section and 30 circumferentially, making a total of some 9000 bolts on the average tank. These bins are frequently owned by the Government and are used to store grain delivered to it by farmers in repayment of price support loans.

When the company was organized in 1948 it was standard practice to do the work with hand ratchet wrenches. That was a slow fatiguing procedure, and it was observed that nuts run at the end of a day were inevitably not as tight as those applied early in the morning when the operators were fresher. There was, however, some skepticism about the use of power tools because they would have to be light enough to be easily handled on ladders and scaffolds and still sufficiently sturdy to run nuts steadily ten hours a day.

Then in 1949 the concern put an Ingersoll-Rand Size 4-U electric Impactool on the job. Of lightweight—6 pounds 8 ounces—it ran the nuts on without transmitting torque or twist to the worker, a feature made possible by the impact mechanism which spins the nuts on until it meets a certain resistance and then tightens them with more than 2000 hard rotary blows a minute. A similar tool, the Size 504 air-powered Impactool which weighs only 5 pounds 12 ounces, has been used for like applications.

In erecting the tanks, a reinforced-concrete foundation is first poured and then a gin pole is raised to hoist the steel sheets. To start the aboveground operations, two sheets are hand-winched into position, and while they are held by two men a third inserts a few bolts to keep them in place. The vertical edges of the sheets have an overlap with a channel stiffener on the inside. After a full ring has been set up in this way, the workers go back and put bolts in the remaining holes. One on the inside of the bin inserts the ½-inch-diameter bolts, and another on the outside starts the nuts and runs them up lightly with an Impactool. They are left slightly loose to permit a reasonable amount of "give" for the assembly of the next lift in the same manner, scaffolding being raised as height increases.

The sheets in succeeding circular sections are arranged so that the vertical joints do not coincide. The rings are fastened to one another by bolts that pass through chimes or flanges on the edges of the plates and can therefore be placed by only one man. When a tank has attained a height of three rings, or 24 feet, a man starts at the bottom with an Impactool and tightens all the nuts, moving upward as construction progresses.

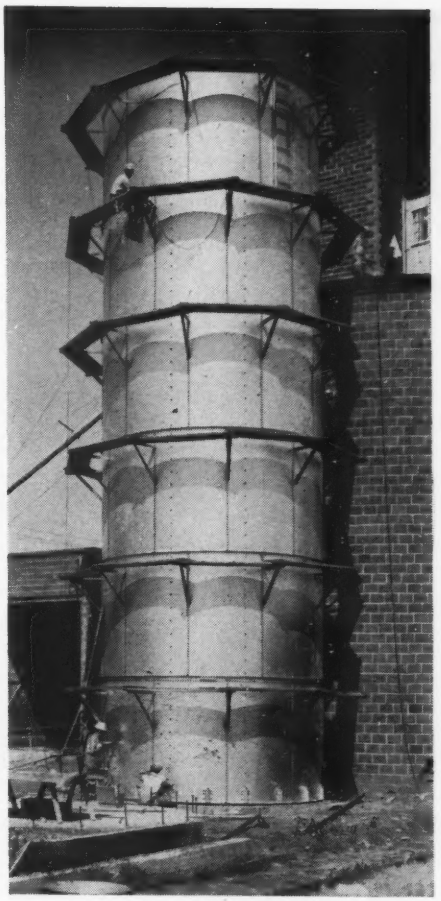
Because the company originally used hand wrenches, it is possible to compare the two methods and to arrive at the time savings brought about by the Impactools. (The firm now has three Size 4-U and two heavier-duty 8-U tools.) By the old procedure, bolt-placing, nut-starting and tightening operations required, roughly, 250 man-hours in the case of the average tank. With the modern tools this has been cut to 100 man-hours, or by 60 percent. Currently, the wage rate in the Midwest for this class of work is $1.90 an hour. Consequently, the labor saving means a reduction of $285, or approximately twice the cost of one of the tools. At the time the foregoing data was compiled, 25 tanks had been erected at a saving of more than $7000.

One notable job contracted by the company was the building at Muscatine, Iowa, of a 53,000-bushel tank 38 feet in diameter and 56 feet high. It is believed to be the largest grain bin in the state and called for the staggering total of 19,000 bolts to hold the sheets together. The work of inserting the bolts, starting the nuts and tightening them—once loosely and the second time to draw them up tight—involved around 200 man-hours. Based on prior experience, Mill & Elevator Service management estimates that it would have taken a minimum of 500 man-hours to do the job with hand tools.

The Impactools are well-nigh in continual operation throughout the daily 10-hour shift, yet company officials report that maintenance is moderate. According to Dale Cloud, president of the firm, there are several advantages to the use of Impactools. They insure customers faster service and better, tighter tanks. In addition, they enable the employees to handle a greater volume of work while not only paying for themselves but also returning an appreciable profit to the company.

EASY TO OPERATE

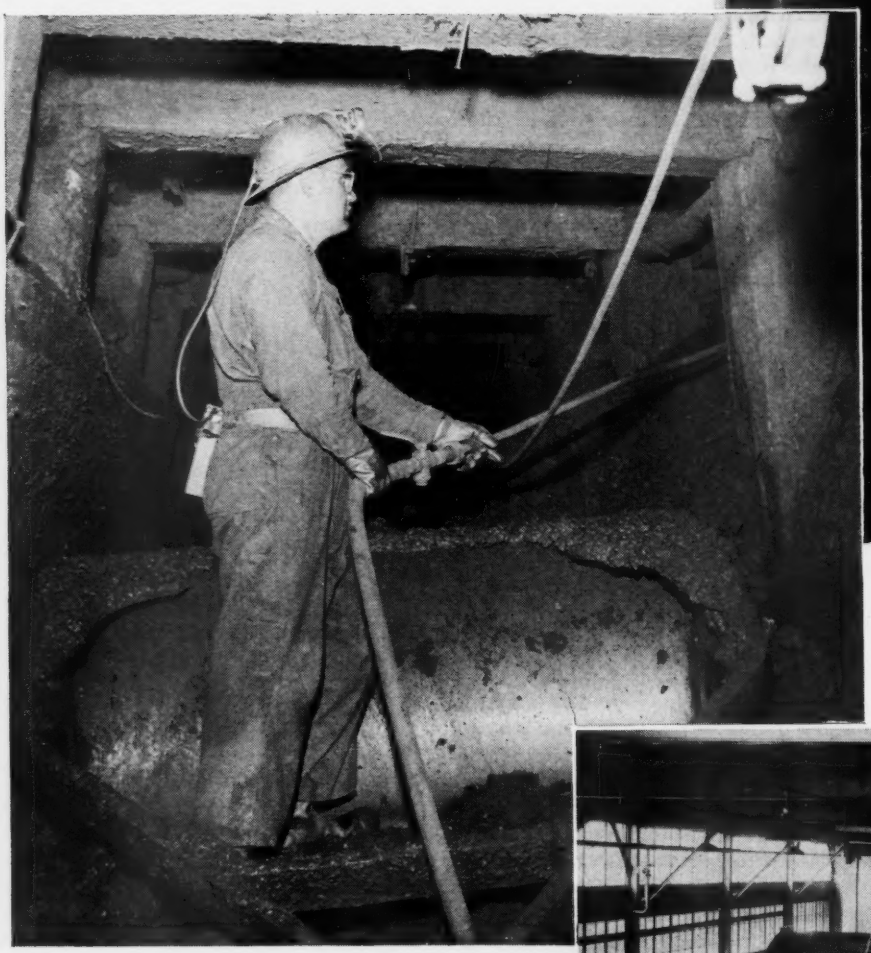
Where men work a 10-hour shift on ladders and scaffolding the lightweight tools are much appreciated. Impactools operate equally well in a horizontal or vertical position, as shown here.



NEARING COMPLETION

This storage tank is 15 feet in diameter and 48 feet high and is put together with about 6000 bolts. The use of Impactools has cut the man-hours required for assembly from 175 to 70.

Thanks to his special clothing, the man pictured at the right is fairly comfortable working in a temperature of around 400°F between two gas-fired furnaces in the Belleville, N. J., factory of Walter Kidde & Company, Inc. The suit and hood are made of a pliable herringbone-type fabric coated with aluminum that reflects, it is claimed, 90 percent of the heat. The gloves can withstand 1600 degrees, and the shoes are of asbestos. Air required for breathing and cooling is taken from the plant line and fed through the hose connection to the windowed mask after passing through a purifier and pressure reducer.

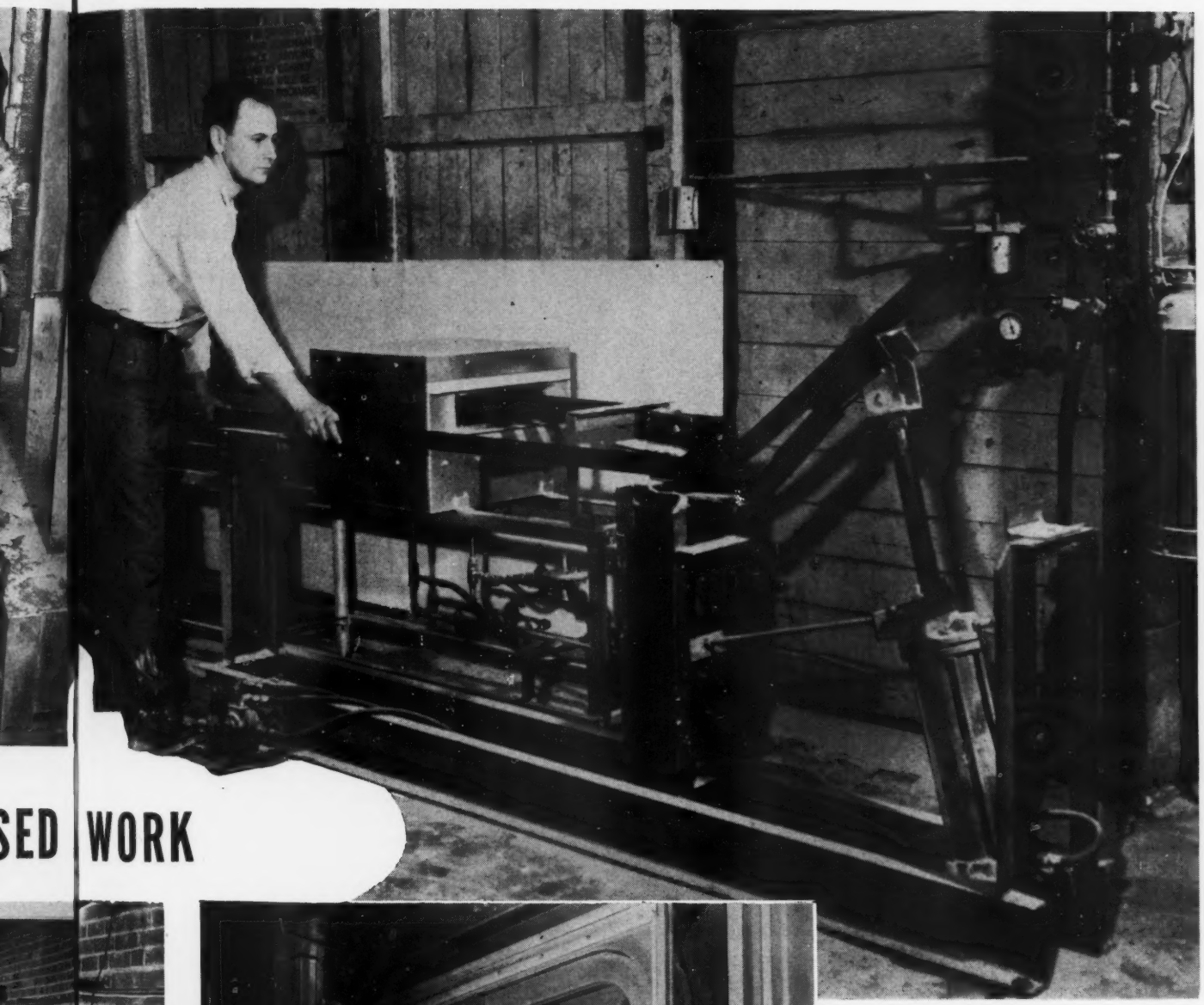


COMPRESSED W

Materials that tend to cling or clog can often be freed and made to flow by injecting compressed air into them and between them and the surfaces to which they are adhering. The picture above shows an air lance being used to loosen iron ore in a chute that feeds the scraper on which the trammer, Stanley Bors, is standing. The scene is underground in the Buck Mine of the Verona Mining Company at Caspian, Mich.

A switching station on a conveyor system in a southern factory is pictured at the right with the goods, in this setup, traveling toward the back. The operator can move the roller section to connect with any one of the three extensions shown merely by operating a lever. The switch section is shifted by cylinders actuated by air at 80 psi pressure. The device is manufactured by Alvey Conveyor Manufacturing Company, St. Louis, Mo.

SED WORK



At the Barrows Porcelain Enamel Company, Cincinnati, Ohio, pipe that has been glass-coated inside and out is bent at angles up to 45° in the machine pictured above. The required pressure is exerted by the piston of the air cylinder at the lower-right, and the pipe is heated to 1500°F just before it is applied. The glass-lined piping is used for handling corrosive liquids.

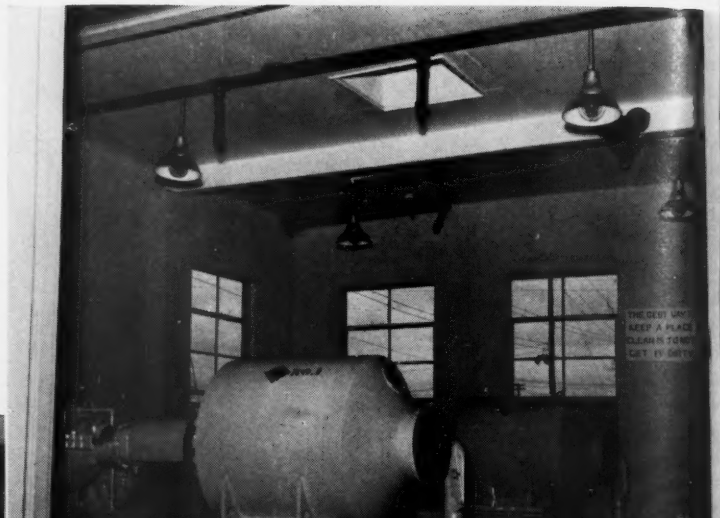
●

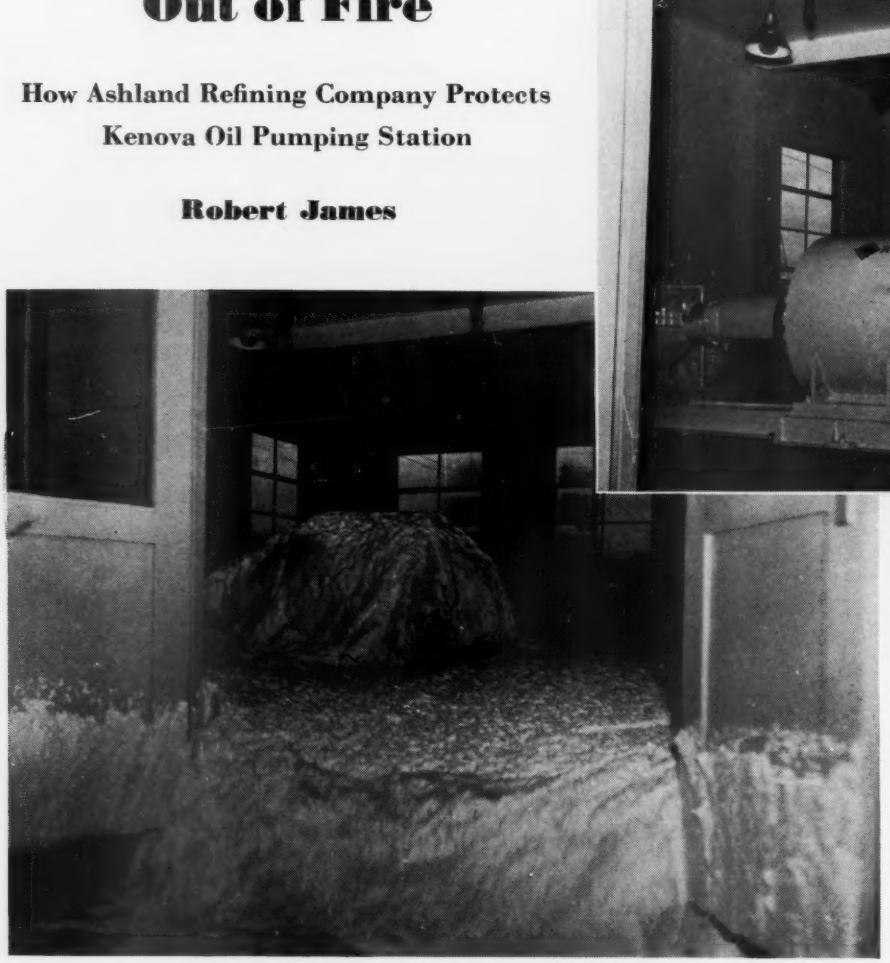
Aluminum-framed, double-glazed windows in the new Alcoa Building in Pittsburgh, Pa., are made tight-fitting by an inflatable butyl-rubber tube running around the outer edge. Each window pivots on a vertical axis and can therefore be reversed for cleaning from inside the structure. The picture shows a girl inserting a tool to deflate the gasket. Air for inflation, at 30 psi pressure, is supplied by a small portable compressor that is hauled around on a pushcart. As the building is air conditioned, windows are normally kept closed.

Taking the Terror Out of Fire

How Ashland Refining Company Protects Kenova Oil Pumping Station

Robert James





BEFORE AND AFTER

The main pumps of the station (top-right) are driven by Allis-Chalmers explosionproof motors. Overhead may be noted three of the foam-dispensing nozzles. Between the two in the foreground is a thermostat that will put the system into operation if the temperature rises sufficiently. The other picture shows the same room when the doors were opened following a test of the fire-fighting equipment. The pumps and motors had been covered with tarpaulins to simplify cleaning up afterwards. The clinging and flowing characteristics of the foam are apparent.

BACK in 1924, when the Ashland Oil & Refining Company (then known as Ashland Refining Company) was started, the possibility of losses by fire in the petroleum industry was always a matter of serious concern. Today, the use of modern methods of fire prevention and fighting has done much to lessen that danger; in fact, there are automatic systems in service that are capable of extinguishing a fire without any other help.

Recently, the Ashland Oil & Refining Company installed the most modern apparatus of this kind in its pumping station at Kenova, W. Va. It is of the foam fire-extinguishing type that is completely automatic in its operation and can flood the pump house and outside manifold with up to 26,880 gallons of smothering Pyrene foam within fifteen minutes from the start of a blaze. A thermostatic device located near the ceiling of the station initiates the snowstormlike flow by responding to a sudden rise in temperature and turning on a Motorpump, which forces water under high pressure into two tanks filled with the liquid foam stabilizer. The solution is piped to a series of nozzles, where aspirated air causes it to expand, spraying the foam formed down upon the pipes, motors and oil pumps and covering the floor to a depth of several feet.

The foam, which is fireproof of course, clings tenaciously to all surfaces, spreading out over and floating on top of any pools of oil resulting from leaks or breaks in the piping. It readily smothers the fire and protects the valuable machinery. Besides, the solution is noncorrosive—does not harm or rust the pumps and motors—and is easily cleaned up afterwards. The action of the system is shown in accompanying pictures that were taken during a test of the installation. Only half of the solution was used for the experiment, and the flow of foam lasted 7½ minutes.

The Kenova pumping station receives oil from the company's barges plying the Ohio River and relays it to its refinery at Catlettsburg, Ky. There the crude is refined and converted into regular and ethyl gasoline, kerosene, domestic and industrial fuel oil, asphalt, jet aviation fuel, etc. Some of these are marketed under the trade name of Ashland. Products from other refineries owned and operated by Ashland Oil and located at Louisville, Ky., Freedom, Pa., Buffalo, N. Y., and Canton and Findlay, Ohio, are sold under the names of Aetna, Frontier, and Valvoline (a motor oil). Others are distributed by independent dealers under their own trade names.

Much of the oil that passes through the station is brought by barge from Louisiana oil fields up the Mississippi to the confluence of the Ohio and thence to the terminal at Kenova. River transportation is handled to a large extent by the company itself, particularly since the latter part of 1951 when the *Allied-Ashland* and the *Aetna-Louisville*, believed to be the most powerful towboats on the inland waterways, were added to its fleet. Each of these giant tugs develops 4800 hp and can push barges containing 175,000 barrels or 7,350,000 gallons of crude oil upstream to Ashland's refineries. Just one of these boats with its integrated tows is more than 1/5 of a mile in length. In addition the company operates several other tugboats and also ships oil to the Ohio River refineries and terminals by contract carrier barges.

When a barge docks at Kenova, the oil flows through the main pumps to the refinery at a rate of as much as

4000 barrels an hour, and the new protective installation was especially designed to handle a fire that might occur during this peak pumping period. So sensitive to a rise in temperature is the detector that controls the start of the foam cycle that a rag soaked in hot water and applied to it was all that was needed to set off the test pictured.

The pump—an Ingersoll-Rand 3-CRVH centrifugal Motorpump—forces water at approximately 150 psi into the foam-stabilizer tanks, each of which holds 60 gallons. The spray nozzles which apply the resultant foam are suspended from the ceiling of the building and from an arm overhanging the outdoor manifold. Each is about 15 inches long and 2½ inches in diameter and includes the air aspirating unit and a baffle against which the mixture of air, water and foam compound is directed to insure proper distribution. Expansion of the water-foam compound solution is about 8 to 10 times the original liquid volume.

There are two general kinds of foam stabilizers in use: one is designed for service against petroleum-base liquid hydrocarbons such as gasoline and the other against water-soluble solvents like alcohols, esters and ethers. The latter type may be utilized for fighting both classes of fire or a combination of the two hazards that might occur in chemical process industries.

OUTSIDE EFFECT

A test snowstorm precipitated over the outdoor manifold where oil is routed to the refinery. Note the circular pattern of the foam spray as it leaves the nozzle and also how it adheres to the valve wheels below.

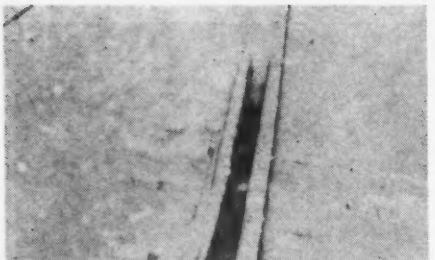
The development of the foam extinguisher came about shortly before World War II when scientists were searching for something to replace the "blankets" of carbon dioxide that were then commonly used to control blazes in lighter-than-water liquids. A number of improvements were made during the conflict, particularly by the Navy, which provided many oil tankers, mother ships for torpedo boats and submarines, and aircraft carriers with foam systems. The foam was referred to by that branch of the service as bean soup—and not without reason, because the hydrolized protein in the reagent was largely of vegetable origin—soybeans, for example. Since that time an increasing number of companies, typified by Ashland Oil, has installed equipment of this kind as the most efficient and positive means of fire protection available.

FOAM-GENERATING EQUIPMENT

The thermostat in the main pump room will, if a fire breaks out there, start up the Motorpump (foreground) which will force water into the 60-gallon tanks of Pyrene foam-forming compound. The resultant foam will be piped to the spray nozzles. Valving permits emptying one tank before the other one comes into play.

Waste Asbestos Salvaged

IT IS reported that present supplies of raw asbestos are critically short, and it is therefore of interest to learn that the National Bureau of Standards has developed simple methods by which fiber can be reclaimed from discarded asbestos and asbestos-cotton fabric. The work was undertaken at the request of the Navy Bureau of Ships because large quantities of asbestos cloth and molded asbestos, used to insulate pipes aboard naval vessels, are thrown away when they are repaired or refitted. By the processes, extraneous material such as cement and paint are removed from the material either by treating it with hydrochloric acid or a hydroxide solution. This is followed by thorough rinsing. Then the fabric is reduced to fiber in a paper-pulp beater. Recovery of asbestos from molded insulation is impracticable.



EFFECT OF BLOW

These pictures show a switch at the beginning of the blowing period (left) and after blowing had stopped.

Railroad Rescuer

Pneumatic Switch Cleaner

J. C. Pierce

COMPRESSED air, a vital factor in railroading, has again come to the aid of the industry with a device known as the Racor Snow Blower, which is designed to keep switches in efficient operating condition by keeping snow and dirt and other foreign matter out of the spaces between switch points and rails. Judging by what has already been accomplished, there is every indication that the new cleaning system will become a valuable addition to regulation track-maintenance equipment.

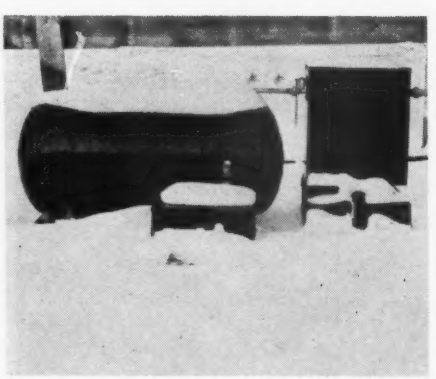
Railroad switches themselves need no description here, but some facts relating to their upkeep are little known outside of railroad circles and are worth consideration. To the layman, a switch is a relatively simple mechanical device that, by merely pressing a button or throwing a weighted lever arm, controls traffic between tracks. That, so far as he is concerned, is about all there is to it, except that a man with a swab occasionally dabs a little grease on a few joints of the assembly. Railway men wish that this picture were a realistic one.

In the busy yard and on main-line tracks the switch is as important as any other piece of railroad equipment—rolling or stationary—and at times is the object of grave concern. Examples of what may happen when one does not function properly need not be listed here, but it should be mentioned that managements install the best switches money can buy and take every precaution to keep them in peak operating condition.

At the turn of the century, pioneering roads were faced with the problem of obtaining adequate equipment for all purposes, including maintenance. Foundries and forges were not prepared to handle the business, and new designs or replacements were often furnished only after serious delays and at great cost. A group of farsighted men then decided to take corrective measures, and in 1902 consolidated five foundries. That marked the beginning of the American Brake Shoe Company, which has expanded greatly in the meantime and, through research, has played a foremost part in making the American railroads the efficient carriers that they are. It is this organization that has been instrumental in developing the Snow Blower.

Advances in metallurgy, founding and machining made it possible to provide switch components with reliable physical characteristics, and engineering skill produced the mechanisms for remote or direct control that assure virtually foolproof operation under ordinary conditions. With all that, it would seem that the railroad man's switch problems had been solved. Actually, that may be true in some regions, but not in others that are gripped months on end by Jack Frost.

Snow and ice are the maintenance man's chief adversaries in his struggle to keep switches clean and functioning. Their removal with shovel, pick and broom is tedious and hazardous and is still depended upon in places where such attention is required only occasionally. (We have been told that it has cost as much as $2800 annually to keep a single switch up to standard, and that may not be an unusual case.) But where switch-clogging weather prevails for prolonged periods, and where traffic justifies the expenditure, the work is now generally done by automatic means.



SETUP NEAR STATION

Cycling tank and other accessory equipment installed near a switch in a Calumet City, Ill., railroad yard. Air is piped to the tank from the yard supply system.

One popular cleaning method calls for the use of gas burners that direct the flame on to the switch, causing the snow to thaw. However, they are only partly satisfactory because they have been known to set ties afire and even oil tank cars and diesel engines stopped over a switch so equipped. When temperatures are below freezing, the melted snow may form ice and again render a switch inoperative. On main lines, the air drag of fast-moving trains often extinguishes the flame, and high winds do the same thing. And overheating of rails sometimes results in warped track.

There are also electric heaters that melt the snow as fast as it falls and prevent the formation of ice between switch points and rails as well as under the points except when temperatures are very low. This type of heater eliminates both the fire hazard and overheating of the rails, and it is unaffected by winds and the air set in motion by speeding trains. But in either case, unless the melted snow can be removed from the area, the roadbed becomes soaked, and alternate freezing and thawing cause heaving and distortion of the track. Obviously, something was needed that would be fully automatic and that could be depended upon completely to dispose of the freshly fallen snow either continually or intermittently in predetermined cycles from around the switch points. The answer was found to be compressed air.

It was logical to assume that if air could be used to sweep away snow, it would serve equally well in places where

wind-borne sand and dust accumulations clog switches. One major railroad company is applying the method with success in its yard at Superior, Minn., where iron ore, shaken out of cars as they are shunted around, seriously interfered with switching operations. The same thing is true of coal, gravel and other heavy materials jostled out of cars in yards or at switching points en route.

The idea of using compressed air to clean switches was advanced several years ago by a roadmaster on the Great Northern Railway, the system that is just south of the Canadian border and extends from Minnesota to the Pacific Coast. There is probably no other major railway in the United States that is so exposed to the ravages of snow and ice and that has to fight so hard to maintain traffic schedules over the white summits of the Cascade and Rocky Mountain ranges and across the wind-swept plains of Minnesota, North Dakota, Montana and Washington.

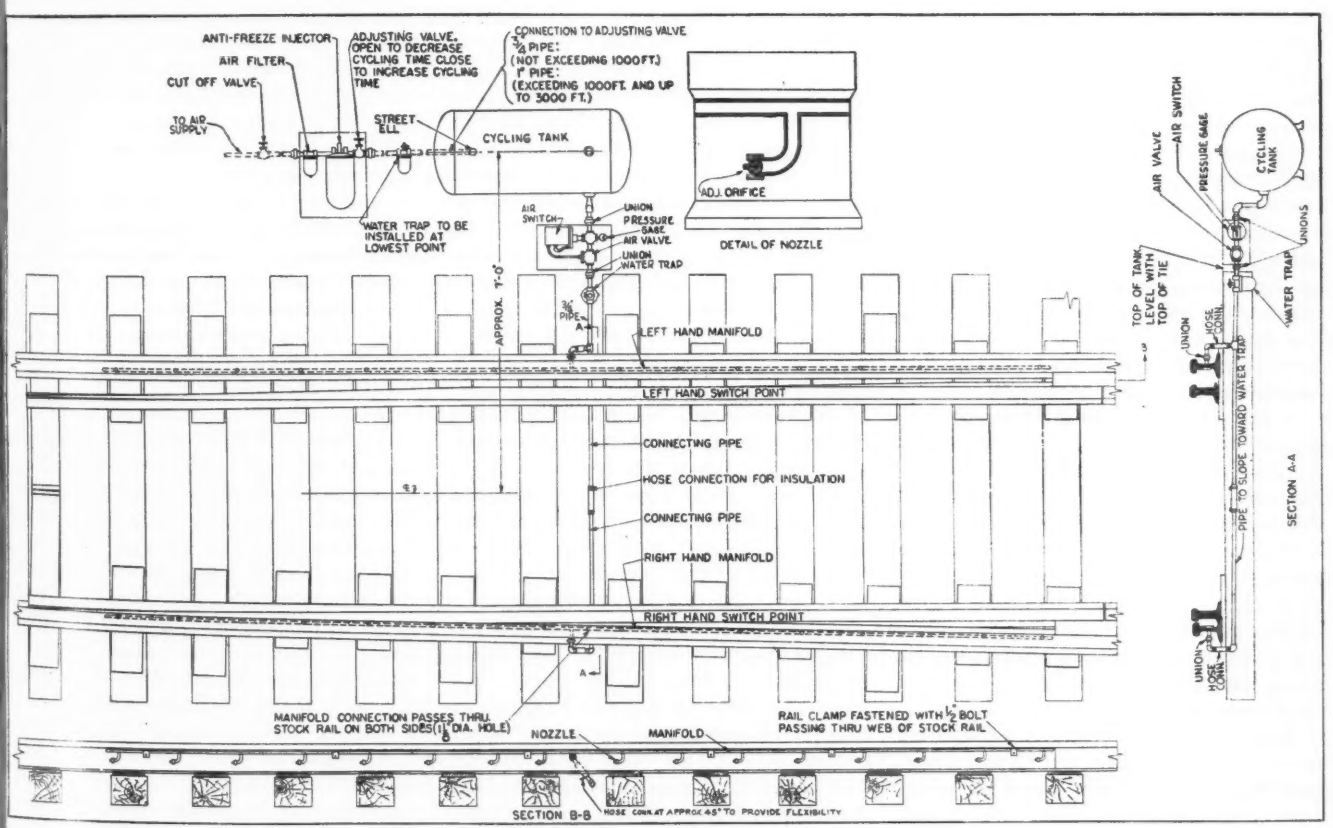
At first, the notion seemed impracticable because it was believed that the blast would have to be continuous and demand huge volumes of air; that is, prohibitive outlays for compressor installations. Then tests were made with a cycling valve to deliver air intermittently, and herein lay the answer to the problem. American Brake Shoe Company took over the research from there and has placed a sufficient number of units in operation to prove the practicability of the device and to tabulate cost data.

Air for the Snow Blower can be supplied either by an individual compressor serving one or more switches or, in the case of a railroad yard, by the main air system. It should be applied at about 100 psi, must be clean and dry and contain antifreeze, which is necessary to prevent ice from clogging the orifices of the blower nozzles where any remaining moisture in the air would condense. It also keeps the mixture of compressed air and atmospheric air from freezing and adhering to the track assembly and sleet from accumulating and solidifying in the switch.

The antifreeze injector introduces a small quantity of denatured alcohol into the air stream at a constant rate and is interposed between the filter and a cycling tank. The latter is located either above- or underground at the switch and varies in capacity with the size and the number of switches it serves. When the air pressure in the tank reaches a predetermined point, say 90 psi, an air switch opens a valve, causing air to flow to the blowing nozzles until the pressure is reduced to approximately 70 psi. At that point the switch closes the valve, the pressure in the tank is again brought up to 90 psi, and the cycle is repeated. It can be varied within certain limits, but normally the ratio of blowing time to build-up time is approximately 1 to 10. For example, if the blast is for a duration of four seconds, it would take about 36 to 40 seconds to recharge the tank.

The air released from the cycling tank passes through a pipe into manifolds which are attached to the rails in such a way as not to interfere with the switch points when they are thrown from one position to another. They are provided with adjustable nozzles spaced approximately 15 inches apart and usually set to direct their blasts toward the points of the switch. Each jet serves as a booster for the one ahead, the aggregate force at the recommended pressure being sufficient to move all loose material from the space between the points and stock rails and from beneath the points. The speed attained by the air during the blowing cycle is said to be around 60 miles an hour.

The original installation was made at Whitefish, Mont., in December, 1950, and three Snow Blowers were tested that winter. Six were added the winter of 1951-52, and some 25 more were put in service last season. Data accumulated during those periods show that the operating cost of the pneumatic method is approximately one-fifteenth that of hand labor and from one-third to one-fifth that of heating devices, or 13.7 cents per hour, with antifreeze accounting for about one cent of that sum.



TYPICAL ARRANGEMENT

Showing the various components of a blowing system. If no air lines run near the switch, a compressor has to be provided and enclosed for protection. The cycling tank may be buried between tracks or at one side of them.

Detecting 'Doctored' Steel Scrap

SURPRISE!

After the bundle has been laid open by the exploding dynamite, some strange-looking "steel" scrap is revealed. Wood, for instance, as pictured here. Among other masquerading materials commonly found are dirt (sometimes filling almost the entire bale), grease, grindings and borings of miscellaneous metals, rags, BX cable and tar.

PIERCING A BUNDLE

A portable platform with an opening in the center is placed over the bale, which is then pierced as shown by an 80-pound paving breaker fitted with a special tool forged from hexagonal steel bar stock. A bundle with a hole so made is pictured in the inset.

DYNAMITE blasting is resorted to at the Bethlehem, Pa., plant of Bethlehem Steel Company to open bundles or bales of purchased scrap metal for inspection. The method, which is similar to that long used for secondary blasting of large boulders in stone quarries and open-pit mines, involves punching a shallow hole in the bale, inserting an explosive, detonator and wire and capping the hole with mud prior to firing the charge electrically. In this instance, however, the hole is put in with a paving breaker instead of a rock drill.

A considerable and growing proportion of the scrap bought by steel mills consists of automobile bodies, refrigerator carcasses and similar sheet-metal fabrications that have been compressed into compact blocks to facilitate loading them and to conserve space in the railroad cars that transport them. The visible outside portions of the bundles are invariably composed of desirable steel scrap, but the materials inside often are startlingly different.

The scrap has its origin in a thousand or so widely varying places and may pass through numerous hands en route from junk heaps to mills. Along the line some of it occasionally falls into the hands of individuals who are without scruples when it comes to doing a little adulterating. Except that they deal with a less valuable commodity, these tamperers are brothers under the skin of counterfeiters of currency and "salters" of gold mines. Truly, the art of deception is practiced in strange ways.

Steel-mill men are no longer surprised by the heterogeneous character of these spurious contents, which range all the way from chunks of concrete to rubber hose. Electric motors that no longer run, copper-bearing wire or fittings, tin cans and other nonferrous substances are familiar sights to them, and they also see bricks and just plain dirt. Lots of these stowaway materials would give a healthy blast furnace a coughing spell if it tried to digest them. They not only won't make steel but, worse yet, some of them are ruinous contaminants. Aside from all that, steel companies don't relish being bilked. When they pay for steel scrap, they want steel scrap.

Consequently, as a matter of self-protection, the mills open up a few bundles at random to have a look inside. It's something like the old but waning custom of plugging a watermelon before buying it. It's not that easy, though, and hardly so pleasant to contemplate. A cube of compressed steel has a rather tough hide and it takes more than a can opener to penetrate it.

Before adopting the blasting procedure, Bethlehem tried drilling, friction sawing, band sawing, torch cutting and cold shearing but found all of them unsuitable because they were too slow or expensive, or they distorted or destroyed the bundle's contents. The method now practiced was then tried out and reached its present effectiveness only after considerable experimenting.

All purchased scrap arriving at the mill is now inspected during daylight hours, and 2-man teams are assigned to the task in the interest of safety and efficiency. Six bundles are taken from a car in an isolated section of the yard: two from each end and two from the middle. Into the center on one side of each cube is driven a 2-inch round hole to a depth of 8 or 10 inches, using an Ingersoll-Rand CC-80 paving breaker and a special, pointed steel tool fashioned from a piece of 1¼-inch bar stock of hexagonal section and 32 inches long. Air at 90 psi pressure to power the paving breaker is supplied by a 105-cfm portable compressor.

The opening thus made is loaded with one stick of duPont 30 percent special gelatin dynamite and a blasting cap to which is attached a wire for firing. The hole and the area immediately around it are then capped with wet fire clay. The six bundles are blasted together. After the powder man has made certain that all charges have exploded, an inspector examines the bales, which are well opened up by the shot without the contents being scattered widely.

Throughout the operation the bundles are tagged to show their car number, type of scrap they are supposed to contain, etc. One car out of four received from each shipper is normally sampled, but if inspection divulges poor-quality material, all cars from that particular source are checked.

Paul Bunyan Has a Rival

LOADING LARGE LOGS

The picture shows a Bucyrus-Erie 37-B power shovel loading logs with the aid of air-operated tongs attached to the dipper stick. The air storage tank is on top of the cab at the right. The tongs will handle any log that the dipper stick can lift. When photographed, this machine was being used at Springfield, Oreg., by the Weyerhaeuser Timber Company.

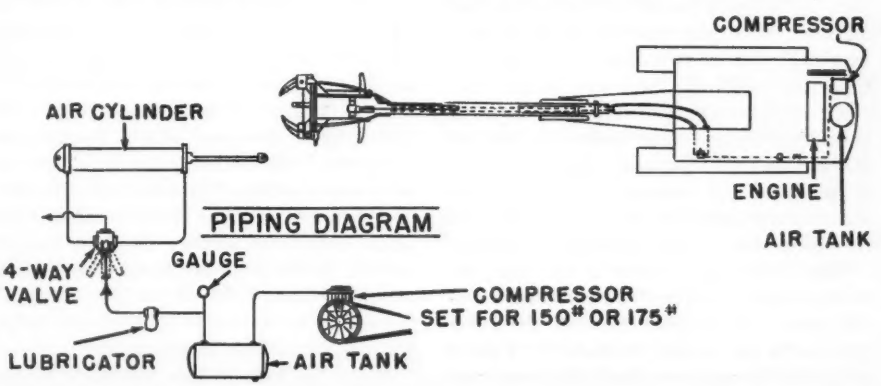
IN THE lumbering regions of the Northwest, the Berger-Rees air tongs is being hailed as the best log handler seen since Paul Bunyan and his blue ox Babe retired from the scene. The tongs can pick up and load huge sections of trees without difficulty. It works like the utensil used for serving lump sugar, olives, etc., but is much larger of course. And the squeeze that gives it gripping power is supplied by compressed air instead of finger muscles.

The tongs can be attached to the dipper stick of any power shovel, regardless of the latter's rating. It comes in four sizes with openings of 24, 30, 42 and 50 inches to fit shovels ranging in capacity from ¾ yard to 2½ yards. Opening and closing are effected by a double-acting air cylinder that links them at the top. The legs are bowed to conform to the contours of logs and can be had with three steel "rooster" spurs on the inside of each one to give the grip more bite.

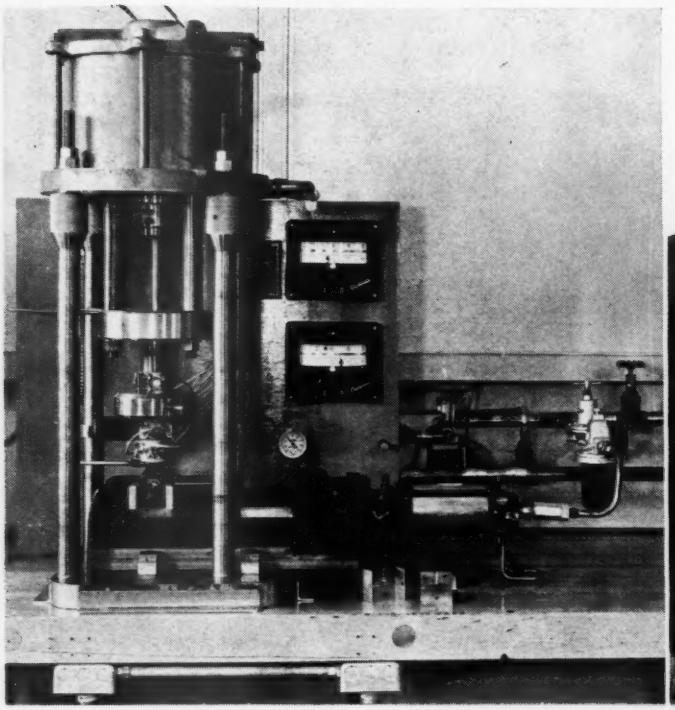
Operating air is furnished by a 30-cfm compressor installed in the shovel. It discharges at a maximum pressure of 150 psi into a 30x48-inch tank that holds a sufficient reserve supply of fluid power to meet the normal demand. The air is piped up the dipper stick, or inside of it if that member is hollow, and delivered by hose line to the cylinder. A control valve is located at the operator's station.

The appliance was conceived by L. N. Rees, superintendent of two logging camps of the Crown-Zellerbach Corporation, of Seattle, Wash. Design details were worked out by the Berger Engineering Company, of Seattle, which then began production. It is claimed that the device has greatly reduced the loading time per log and made the handling of small pieces of timber and broken "chunks" economical for the first time. In one case cited by the manufacturer, five trucks were hauling all the logs that could be loaded with conventional equipment. When the change to tongs was made, loading was speeded so much that six more trucks were put to work. The new method is also safer than the older ones because no one has to be in the proximity of the logs during the loading operation.

A log is grasped at a point on the near side of the center. As it is picked up, the far end swings down and the near one rises and "heels" against a saw-tooth plate that keeps it from shifting sideways. The butt of an unusually long log clears the plate and rests against the underside of the dipper stick. The tongs will handle any log the shovel can lift. Only one man is required to operate it as compared with two or more for other loading equipment. When there are no logs to be handled, the shovel can be reconverted to its original form and used for excavating.



Pneumatic Press Develops 70,000 Pounds Pressure



500 TO 1

When compressed air from the laboratory's distribution lines exerts its force on a differential piston in the 12-inch cylinder at the top of the press (left), a pressure 500 times greater is produced at the end of the small vertical ram. In the view at the right Dr. Francis R. Shonka, under whose direction the machine was designed and built, is examining an optical piece that had just been molded. Above his hand is an air-operated vise in which the molds are clamped. The Argonne National Laboratory is operated by The University of Chicago.

A PNEUMATIC injection press for plastics that develops pressures up to 70,000 psi has been built and placed in service by Argonne National Laboratory at Lemont, Ill., for the production of optical pieces for atomic radiation exposure meters. It represents a marked departure from conventional hydraulically operated machines and embodies two features that are unique in presses designed for shaping plastics.

The first improvement is the great flexibility with which the working pressure is controlled. The machine is actuated by an air cylinder and is provided with electric valves that regulate the speed of injection through an adjustable throttle valve. When the pressure in the pneumatic cylinder reaches a preset value, the throttle valve is automatically short-circuited and the air pressure suddenly boosted to the desired value. Thus, when the piston of the injection cylinder nears the end of its stroke, the pressure applied to it is increased. A pressure of 1 psi in the air cylinder exerts a pressure of 500 psi on the piston of the injection cylinder.

The other innovation is the temperature control system. In molding critical parts, the temperature of the plastic has to be closely regulated. This is achieved by means of dual controls: one for the upper and the other for the lower section of the injection cylinder. The latter section, which consists mainly of the plastic spreader and nozzle, is constructed of stainless steel with a minimum thickness of only 0.01 inch and reinforced with heavy copper collars to withstand the high pressure. Heat to melt the plastic is supplied by electrical bands and conducted through the copper collars and thin wall. Thus the material is brought to a liquid state in the top of the injection chamber, and as it moves downward it is further heated, entering the mold at the predetermined injection temperature.

Because copper is a good conductor of heat there is less temperature lag than in presses of the customary type. This is extremely important in molding optical components and electrical insulators, because overheating causes carbonization and underheating serious stress conditions in the material.

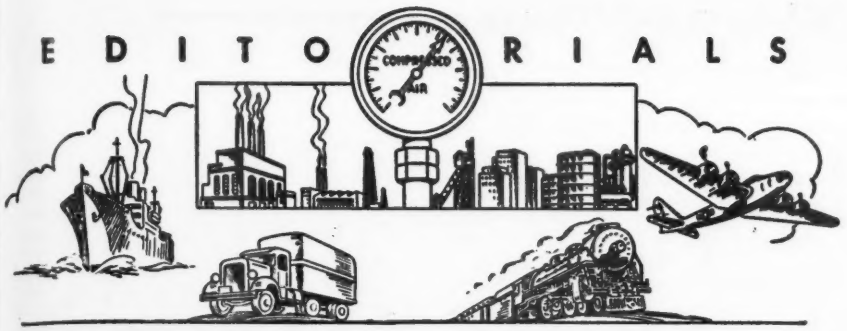
The machine was developed by the laboratory's Research and Development Division under the direction of Dr. Francis R. Shonka. Compared with conventional plastic injection presses it is inexpensive, its components costing less than $1000. They can be assembled and tested in about 250 hours.

Trackless Train

TRACKLESS trolleys are something most of us have heard about, but trackless trains are an innovation. Called Tournatrain, it is made up of eight 20-ton freight cars and has a locomotive equipped with electric generators driven by diesel engines. However, the locomotive does not pull the cars, it simply supplies them with energy so they can be moved by their rubber-tired wheels each of which has an electric motor and gear reduction in its rim. The wheels range from 5 to 10 feet in diameter.

From his cab in the locomotive, the engineer applies power to all the wheels of the train, and through the medium of an automatic steering device each car is made to follow in the path of the locomotive. For example, when the latter pulls up to an intersection and makes a right-angle turn, each car, upon reaching the spot, will make the same turn, so it is claimed. This unusual means of transportation was developed by R. G. Le Tourneau, Inc., for bulldozed roads and desert or other areas where conventional means of haulage is difficult or nonexistant.

EDITORIALS



STRAWS IN THE WIND

AN AMERICAN industrialist's impressions of trade conditions in Europe are interesting in these times when not even a crystal ball can foretell with any certainty what sort of sailing our economy faces during the next few years. Christy A. Wiken, vice-president of research and engineering of Rockwell Manufacturing Company, Pittsburgh, Pa., expressed the opinion after a 3-month tour of ten countries abroad that West Germany has made the greatest comeback of all nations since the war both in rehabilitating former manufacturing facilities and setting up new ones.

Mr. Wiken believes that the West Germans now have the best-equipped plants in existence for producing machine tools, and the view is pertinent because the machine-tool industry is commonly considered to be somewhat of a barometer of forthcoming conditions in the capital-goods field. The only fly in the ointment is that these fine new West German factories aren't getting enough work to keep them humming, as those responsible for them apparently misjudged the demand for such tools.

When the plants were projected, the British, in particular, were anxious to place orders outside their own borders for "special" machine tools which their own establishments could not then turn out. Meanwhile, however, the British machine-tool builders have reached a position where they can handle the business and are so busy that one of the leading companies is quoting fourteen months delivery on turret lathes. Now, the firms say, they are receiving orders at a slower rate than during the past several years. In the long run the Germans, with their efficient new factories and extremely low wage scale, are believed to be in the best position to get the lion's share of new business.

There is food for thought in Mr. Wiken's observation that everywhere in Europe, and especially Germany and England, the system of training apprentices is being revived. He found many plants that were each training anywhere from 10 to 500 lads in the 14- to 17-year range. The usual procedure is to set up special schools for them, with competent instructors. Classroom lessons are interspersed from time to time with 3-month stretches of shopwork. The apprenticeship lasts 3½ years, in which time the boys receive nominal wages.

This movement will insure a future reservoir of skilled labor, something America very likely will not have. For that matter, such a training routine would perhaps appeal little to our youths who, in a few weeks, can learn to operate one machine and get almost as much pay as the all-around machinist who has acquired his knowledge after years of toil. Some American concerns are reported to be planning to take advantage of the European skilled-labor pool by establishing laboratories and other research facilities abroad. In doing this, they can get the type of help they require at a comparatively low cost and also obtain fresh viewpoints on some of their long-standing problems.

If such a move is made, Mr. Wiken thinks Holland will be a favored location because it has a considerable surplus of labor and little unrest among the working classes. Wages and the standard of living are highest in Switzerland and the Scandinavian countries, notably in Sweden, the American industrialist reports.

MODERN PLOWMAN

AN UNINFORMED contractor riding across the great southwestern plains or even in California in winter or early spring might believe that his eyes were playing tricks on him. Here and there, far from a town or any construction project known to him, he might gaze in amazement on a train of heavy earth-moving machinery marching across flat terrain. Actually, he would not be looking upon a mirage, as scenes such as this are becoming fairly common in the prairie regions west of the Mississippi River.

As many as four big crawler-mounted tractors are to be seen at times linked together for greater pulling power and drawing not construction equipment but a king-size plow. The latter may be cleaving the ground to a depth of 5 feet and casting aside a vast stream of earth as it moves inexorably along.

Deep tillage, which is literally turning farms upside down, is credited with increasing crop yields phenomenally and putting new life in worn-out soils. Years of farming have drawn heavily on the original nutrients; normal plowing has permitted the blazing sun's rays to penetrate the top fifteen inches and destroy bacterial growth; while irrigating water has leached out organic matter, plant food and even the finer particles of earth. Such impoverished soil has produced continually declining crops. Plant diseases met little natural resistance, and a streak of hardpan—termed the plowsole layer and developed at the floor of the plowing zone through the years—formed a barrier to probing roots.

Deep plowing goes far below the hardpan, breaking it up and burying it as the earth beneath is brought to the top. Unused fertilizer carried downward by water is brought back up, soil organisms start to work, and crop growth is stimulated. Another benefit is realized in the sandy areas in which the Southwest abounds, there being two million acres in four adjoining Oklahoma counties alone. In dry years, of which there have been several lately, sandy soil that has been plowed blows away, taking seeds with it before they have a chance to start growing. Deep plowing brings clay to the surface and anchors the top soil. If the clay content can be brought up to 8-10 percent the earth will hold well against the wind, and this proportion is possible in many sections. Some Texas fields that were deep-plowed seven years ago are still holding firm.

The new technique was inaugurated in Oklahoma in 1934 or 1935. Plows then available wouldn't go deeper than 14 inches, but since then they have been gradually improved as well as strengthened to resist breakage by stumps or other buried objects. Most of the land was in cotton, and yields that had been pathetically low were increased almost immediately. Because the seeds of surface weeds were buried, cotton-hoeing costs dropped from as high as $9-10 per acre to $2.50 the first year.

Although some plows reach 5 feet down, the average effective depth is probably around 36 inches. When working in the latter range and cutting a 7-foot strip, a plow will move 2 cubic yards of earth with every 3 feet of travel. As it covers around 1¼ acres per hour, it turns up an enormous quantity of material in a 20-hour day. And with more than a million acres deep-plowed in several states so far, the total amount of earth shifting is staggering.

All this is of interest to established contractors in the areas concerned. During winter and early spring, which are their normal slack seasons, many of them are now plowing farms on contract, thus keeping some of their equipment busy the year round. But before they got into this new business some strictly agricultural contractors sprang up to take care of it. Today, some of them are big enough to bid on construction jobs during the nonplowing months and are offering old-time firms keen competition.

This and That

It's an Ill Wind, Et cetera

Since January, 1950, the U. S. Bureau of Reclamation has been driving the 6½-mile Tecolote Tunnel to carry badly needed water for domestic and irrigation purposes to Santa Barbara and four nearby county districts in California. Although 4700 feet of the bore remains to be excavated, the project has, through a quirk of Nature, already provided a sizable supply to the areas concerned.

The water is flowing into the tunnel from the rocks penetrated, and the contracting firm handling the job has been unable to curb it. As a result, the firm has appealed to the Bureau for revision of its contract, and a consulting board of professional engineers has been appointed to study the situation and find a solution of the difficulty. Meanwhile the water, which issues from the ground at about 112°F and reaches a maximum volume of 3700 gpm, is alleviating the drought in the Santa Barbara section.

★ ★ ★

Building Without Mortar

A 30x80-foot structure of concrete blocks was recently built in Kansas City, Mo., without using mortar in the conventional way. Instead, successive courses of lightweight dry blocks were laid on a level foundation to window height and a coating of concrete was applied to the outer surfaces with compressed air. Next, anchoring metal mesh was fastened to the walls and concrete shot against it to a thickness of ¾ inch. Then window and door frames were set and the walls carried upward as before, with air-placed concrete filling the gaps between frames and walls. The structure was put up as an experiment by Air Placement Equipment Company, which makes Bondactor pneumatic guns for applying concrete. The concern's engineers believe that buildings erected as described will save considerable time and money and be satisfactory for many purposes. The structure will be put to use and observed over a period of years to see how it stands up.

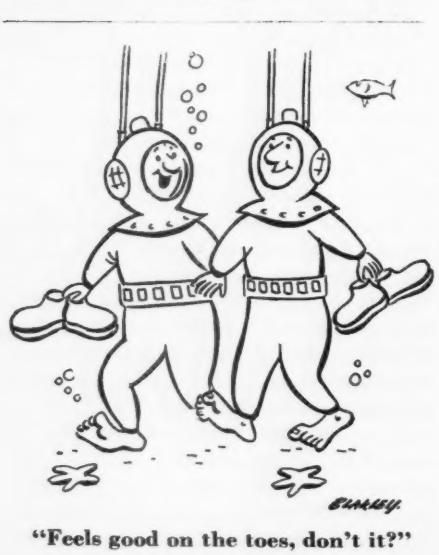
★ ★ ★

Building Leans on Hillside

A rocky knob near the heart of the business district of Kansas City, Mo., was long considered unsuitable for building purposes. It remained undeveloped until Hallmark Cards saw a way to take advantage of the supposedly unfavorable topography and selected it as the site for a $6 million structure. As the building rises adjoining the slope, each of its eight floors will be larger than the one below and will have a direct entrance from the hillside. The eighth floor will be at a sufficiently high elevation to extend over the top of the mound and will contain 200,000 of the total 760,000 square feet of floor space. The roof will be a parking place for nearly 400 automobiles.

The structure will house offices, means for finishing the greeting cards the firm makes and artists' studios with such facilities as a zoo, greenhouse, art gallery and museum. A cafeteria with a seating capacity of 600 will be convertible into an auditorium. Materials received on the top floor will progress downward with the aid of gravity transportation.

An unusual feature will be a "personal-service unit" where employees may procure their automobile licenses, make bank deposits and pay their utility bills. A double-deck bridge will connect the new building with the concern's older plant across the street. A conveyor belt and a pneumatic-tube system will carry materials between the two.



"Feels good on the toes, don't it?"

★ ★ ★

From Oil To Copper

Because the going has been getting increasingly tougher in their own field, some Canadian gold-mining companies have been venturing into the oil industry in recent years. In this country, the Union Oil Company of California has reversed the procedure by opening a copper mine in Arizona. The move came about naturally. In 1950, Union bought United Geophysical, Inc., for use in seeking new sources of petroleum. One of the geophysical field crews detected indications of metal in Arizona, and eighteen bore holes subsequently put down confirmed the existence of a sizable body of good-grade copper ore. A shaft has been sunk 625 feet, and is going deeper. The operations are in charge of a separate subsidiary, Pima Mining Company. It and United Geophysical are headed by Herbert Hoover, Jr., son of the former United States president.

"I think we're getting close. I've finally found a place for our signature."

★ ★ ★

Leaves Ladies Lintless

In an advertisement of New Departure ball bearings it is stated that some of the bearings for precision instruments are so delicate that even a speck of lint or dust might throw them off balance. To guard against this, they are made in an air-conditioned room and the women employed there are required to wear nylon uniforms. In addition, before they go on duty, they are brushed off with a jet of compressed air to remove all lint.

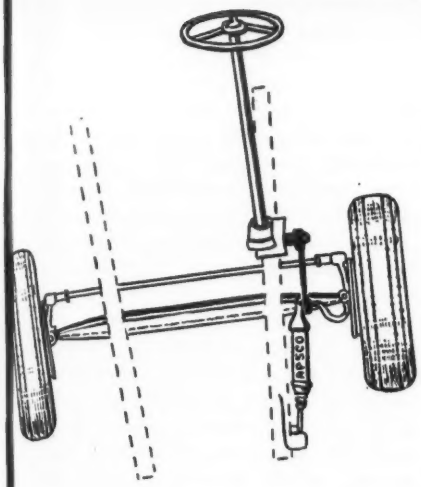
★ ★ ★

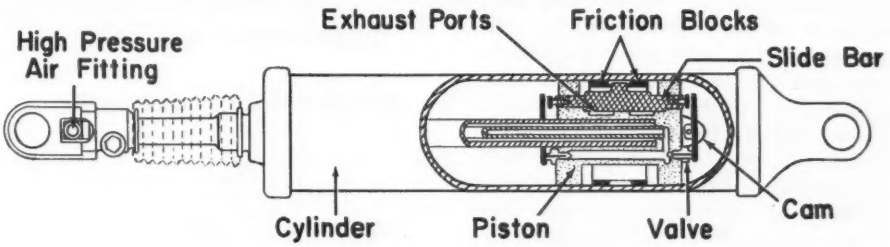
More About Magnets

Ever since we published an article on the varied industrial uses of magnets we seem to run into more of them at every turn. The services they perform in removing tramp iron from unwanted places has spread from their original application ahead of coal pulverizers in steam-generating plants to any number of materials and locations. The latest of these uses to reach our attention is one in a tuna packing plant.

In Youngstown, Ohio, Matt Bozichovich, an employee of Youngstown Sheet & Tube Company, got $500 recently for thinking up a magnet that is shaped to recover ferrous metals from refuse piles. It is built on the lines of an ice-cream cone. When dropped into a trash pile it penetrates well and comes out bedecked with pieces of metal.

Steering Booster Promotes Safe Driving





HOW THE BOOSTER LOOKS INSIDE

The device uses air directly from the pneumatic brake system of heavy automotive vehicles and enables drivers to steer them even on the softest ground. It is attached (left) to the frame at the shaft end and to a moving member of the steering linkage on the other—in this case to the pitman arm. One air line serves the attachment.

A NEW development which should prove of considerable help to operators of heavy trucks, buses, military vehicles and off-the-road construction and maintenance machinery is called the Air-O-Matic Power Steer Booster. Exactly what its name implies, the unit is easily attached to new or old vehicles of all types and is operated by air from the pneumatic brake system.

The booster embodies an ingenious valving arrangement that admits air to one or the other end of a double-acting cylinder when caused to function by the truck driver through the steering gear. The twin valve is partly on and within the piston and is made up of the following components shown in an accompanying illustration: of a set of friction plates bearing directly on the cylinder walls and attached to a sliding bar that impinges at each end against a lever linkage and of a spring-loaded and normally closed needle valve that is opened by the sliding bar through the action of the lever. The friction plates are within a recessed part of the piston, the bar slideway is inside the piston, and at each end of the latter is a lever-and-valve combination. Air is admitted to the valves from a receiver that is located in the piston and charged by way of the innermost tube of a double-tube hollow shaft.

The booster is mounted with the shaft and fastened to a stationary member of the vehicle, usually the frame, and the cylinder is attached to a moving member of the steering linkage such as the pitman arm or drag link. One air line suffices to bring compressed air to the shaft clevis or fastening. In operation, an initial impetus is given to the steering linkage and, incidentally, to the cylinder by the driver as he starts to turn the steering wheel. The friction plates, of course, tend to move with the cylinder, causing the slide bar to impinge against the lever at the end of the piston facing the receding head of the cylinder. The lever opens the valve and admits compressed air into this cavity. The air, in expanding, forces the cylinder away from the piston and gives the steering linkage a powerful supplemental boost.

As soon as the driver of the vehicle stops turning the steering wheel, the cylinder advances (or retracts) just far enough to center the friction plates in the recessed area, the position in which the valve is closed and the compressed air is exhausted from the cylinder through ports in the piston leading to the outer tube in the hollow shaft. The slide bar covers the exhaust ports at the pressurized end of the cylinder as it moves to open the valve, thus preventing the air from bleeding out until the turning movement is completed. The exhaust ports at the other end remain open and permit the air to escape as it is displaced by the piston.

Manufactured by the Air-O-Matic Power Steer Corporation, the booster unit is said to take most of the work out of steering heavy vehicles, even on soft or sandy ground, and to be completely automatic, safe, jam- and foolproof. The cylinder proper requires no lubrication, but the frame and steering-linkage connections are provided with grease fittings and lubricated when the vehicle is regularly serviced.

Proposes New Valve for Train Air Brake

A FREIGHT train conductor living in Galesburg, Ill., has given the Interstate Commerce Commission an idea he thinks would improve the braking of trains and perhaps reduce accidents. He is David P. Lindberg, a veteran employee of the Burlington Railroad, and he calls his conception an "air-bleed" valve. If attached to the rear car of a train it would, he claims, gradually let the compressed air out of the line and thus set the brakes from the rear forward and thus prevent cars from piling up on those in front in case of a derailment or collision. The idea came to Lindberg after a passenger train out of control plowed into the Washington, D. C., Union Station a few months ago. In a similar manner, he contends, the brakes on a train brought to a halt on a grade would be automatically set if the locomotive were to be detached without the brakes first having been properly adjusted.

ON, UP, AND OFF

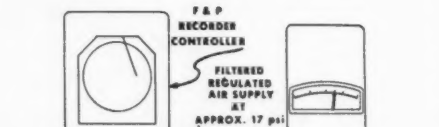
Built to operate with feed-in and discharge belts, this vertical conveyor carries cartons from one floor to another much faster, it is claimed, than can the conventional type of elevator. Cases are delivered by a horizontal traveling belt, which feeds them automatically on to the vertical section. There they are gripped tight between friction-surface belts supplemented by spring-loaded rollers through which the conveyor can adjust itself to take cartons varying up to 2 inches in size. (Can be designed for 4-inch adjustment.) At the upper level an offset roller shoves the cases, in turn, onto the discharge belt. The new vertical in-line system was developed by Conveyor Specialties Company, which installed the first one in a brewery. According to reports, it is delivering cartons from an assembly station in the basement to a horizontal conveyor 30 feet above and has increased the volume handled by 1600 cases an hour.

Companies Combine Instruments for Higher Efficiency

INDUSTRY'S increasing dependence on automation places more and more emphasis on instrumentation. In view of this fact it is only natural that two companies manufacturing complementary types of instruments and controls in which they are specialists should agree to combine certain of their products with the idea that they will serve requirements better when they are designed to operate as a unit. The equipment involved are Permutit's Ranarex gas specific gravity detector and a Fischer & Porter pneumatic transmitter, recorder and control instrument.

The specific-gravity detector works on the basis of differential degrees of torque caused by whirling gases that impinge against impulse wheels. It consists of two chambers in each of which is a fan or impeller driven through a shaft at constant speed and of an impulse wheel affixed to a separate shaft that extends out from the chamber and is connected by suitable linkage to the other impulse-wheel shaft.

A sample of gas to be analyzed is drawn into the lower chamber and caused to rotate by the impeller, which imparts torque to its companion impulse wheel. This torque is proportional to the gas density and is compared with the torque produced similarly but with atmospheric air in the upper chamber, in which the impeller rotates in the opposite direction. The difference between these opposing torques is the specific gravity of the gas and is registered on a calibrated scale by a pointer connected to the impulse-wheel shafts. The measuring instrument responds to changes within 5 to 20 seconds because no chemical reaction is involved, and as the temperature and humidity of the gas sample and air are uniform, the possibility of errors from those sources is eliminated.



PROPORTIONING SYSTEM

Diagram shows how the specific gravity detector and the pneumatic recorder controller are combined to mix manufactured gas and propane.

The other half of the apparatus is the Fischer & Porter deflection-balance pneumatic transmitter that is mounted in the same housing with the Ranarex unit and connected to its pointer by a single mechanical linkage. Thus the high sensitivity of the detector is retained, and any movement of the pointer is immediately translated into a pneumatic force capable of performing such functions as recording, indicating and/or controlling at a considerable distance from the measuring station. Filtered compressed air at approximately 17 psi is used to operate the instrument.

In a plant mixing manufactured gas with propane, for example, the Ranarex-Fischer & Porter combination could be placed at the discharge port of the mixing valve and from there send signals not only to an indicator in the control room some yards away but also to a pneumatic-diaphragm motor control valve interposed in either of the lines leading to the mixing valve. An installation of this kind is shown in the accompanying schematic diagram. In this manner the entire process can be made fully automatic as well as self-recording. Whenever the specific gravity of the mixed gas exceeds or drops below a certain point the valve will either open or close, the difference will be registered on a graph, and the length of time required to bring the gas back to normal will, incidentally, also be indicated.

Glass-lined Smokestack

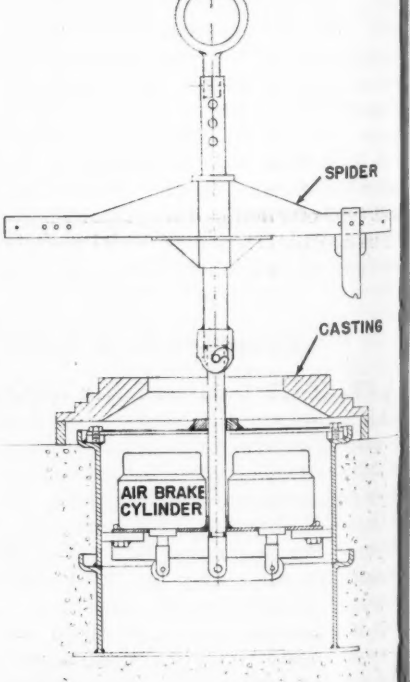
IF EXPERIMENTS now being conducted by the A. O. Smith Corporation are up to expectations, steel smokestacks of the future may be covered inside and outside with a film of special acid-resisting glass. Today, industrial stacks are generally built of steel instead of masonry, and it is estimated that about 5000 have to be replaced annually in the United States because of the corrosive action of the acid condensate in the smoke.

At its Milwaukee, Wis., steel fabricating plant, the corporation has erected a powerhouse stack 85 feet tall that is coated inside and out with two layers of glass each approximately 0.005 inch thick. Bonding was effected at 1600°F by a new method developed by the company, which has had considerable experience with fusing glass to steel. To determine the effectiveness of the lining, glass-encased test panels were suspended in active smokestacks for periods up to a year and showed no signs of deterioration at the end of that time. However, the new and novel stack is considered to be a guinea pig and as such is to be kept under close observation for a number of years.

Air Equipment Mounts Rims and Tires Quickly

ASSEMBLING rims and tires for heavy-duty Autocars manufactured by The Autocar Company, Ardmore, Pa., was an arduous job until plant engineers designed pneumatic equipment that enables one man instead of two or three to do the job quickly and safely and without risk of damaging the tire and rim. The device, plans for which are offered free to the industry, consists of a stepped-down circular casting which can hold wheels or demountable rims 20, 22 or 24 inches in diameter. It is set over a pit, 18 inches deep and 24 inches in diameter, with the bottom at floor level. Mounted on a plate in the pit are two 6-inch diameter Westinghouse air-brake cylinders with a 2¾-inch stroke and a capacity of 1500 to 2000 psi. Their cylinder arms are fastened to an 11-inch steel crosspiece from which a 2-inch spindle rod rises and extends up through the casting to a point about 5 inches above the floor.

The work proceeds as follows: The operator places a rim base on the casting, drops the tire on it, slips on the side ring and positions the locking ring. Then he lowers a 3-armed spider, hooks it on to the spindle rod and locks the two with a quarter turn. The three arms notch on to the side ring and, when compressed air is turned on, force it, together with the tire bead, past the locking ring seat on the rim. A sharp tap with a hammer seats the locking ring, and that's all there's to it, says the company, except to release the air and move the tire to Autocar's new safety stall where it is inflated with air at from 72 to 100 psi pressure.



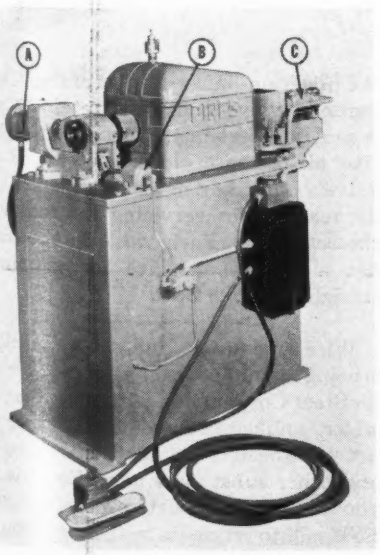
Industrial Notes

From one pound of extra-fine Fiberglas yarn, a New England textile mill is weaving 20 yards of cloth 36 inches wide. The fabric is said to be so sheer that it floats on a puff of smoke. It is being used in making electrical insulating materials and as a reinforcing in plastics.

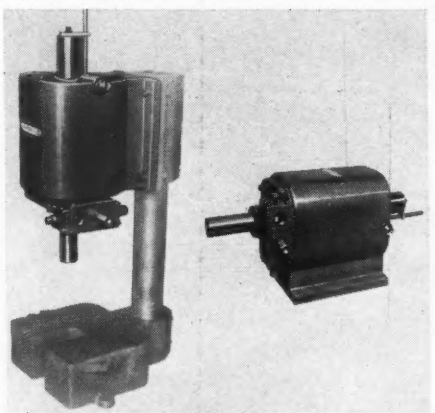
New fire-retardant coatings for wood and metal that form a cellular insulating "mat" when exposed to flame are being marketed by Albi Manufacturing Company. The latter claims that the mat resists both heat and flame and that it can be scraped off easily, leaving an undamaged surface ready for refinishing. The coatings are available in several colors and can be applied by brush or air spray.

Internal Growler is the name of a small electric instrument that has been designed by Crown Industrial Products Company to detect short circuits in rotors or stators. It operates on 115-volt a-c current and energizes the coil area as it is passed over their surfaces. When directly over the trouble spot a meter gives a positive reading through the movement of a needle.

Plants that do a lot of work requiring deburring, chamfering and facing operations are finding a new end-finishing machine very useful, it is claimed. The unit is air powered, has a 2-inch stroke and a maximum spindle speed of 2000 rpm. When the workpiece has been inserted, pressure on an electric foot switch starts the clamping and feeding cycle by admitting air to the three pneumatic cylinders shown in the accompanying illustration. "A" closes the chuck, "B" swings a pivoted work-locating stop out of the way, and "C," a Bellows cylinder and Hydrocheck, advances the spindle and controls the feed rate of the tools. "A" and "C" are supplied with air at 70-80 psi by the same line. When the cut is completed, the spindle automatically retracts and the workpiece is released. The end finisher is built by Pines Engineering Company, Inc., and is designed for such operations as light turning with hollow mill tools, chamfering and pointing bar stock, shaping tube or rod ends and center drilling. Tools and chuck-jaw inserts are interchangeable for stock up to 3 inches outside diameter.



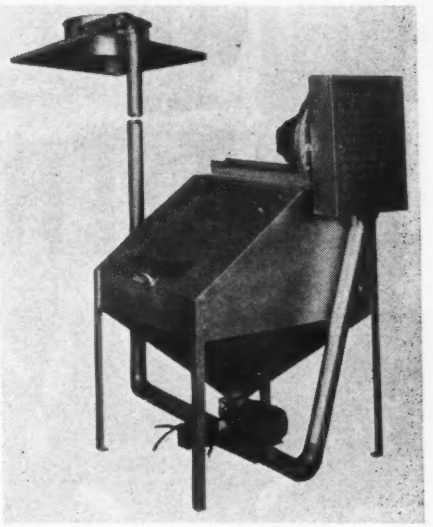
Air-Hydraulics, Inc., has announced that the head of its Model Z-2 "Exploded Air" Impact Hammer is now available as a separate unit for installation upside down or at any angle that best meets the needs of certain operations. By way of example, the company cites the case of a manufacturer who has mounted it upside down and is now "heading six rivets with it instead of one per stroke, gravity holding all six in place while the hit is made." The hammer has a rated capacity of 12,000 pounds, is operated with air at 100 psi line pressure, and rated at 60



strokes per minute when hand or foot controlled and at 120 per minute when equipped with a solenoid valve and guide-rod switches for automatic operation. It is suitable for light stamping, forging, trimming, molding, crimping, coining and riveting.

For field use on sizable construction jobs, Dravo Corporation has designed a magazine for storing explosives that is said to offer a maximum of safety. It's a small portable house set up on a concrete or timber base and provided with a false overhanging roof that shades it from the direct rays of the sun. Built of steel, it has wooden studding on the inside walls, and danger from lightning and static is lessened by grounding the containers holding the explosives.

For jobs that involve handling granular materials of all kinds and that do not warrant the installation of costly pneumatic conveying systems, Injection Molders Supply Company is manufacturing hoists that can be readily adapted

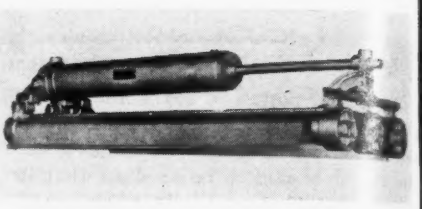


to meet specific needs. The equipment pictured is a stock model, complete with bin, cyclone, motors and feeder pipe. A unit with a bin holding 800 pounds is being used to fill the elevated hopper of an injection molding press with powdered styrene at the rate of 20 to 25 pounds a minute, the operator of the press controlling the flow with a starting switch. Total carrying distance ranges from 50 to 60 feet. If desired, a feed weigher may be incorporated in the system.

It has been announced by Mitchell-Bradford Chemical Company that its newly developed blackening salt will give cast or malleable iron and stainless steel a lustrous ebon finish that will not chip, flake or peel. Called Black Magic S.S., the compound is mixed in the proportion of 5-5½ pounds per gallon of solution, in which the metal is immersed from 5 to 15 minutes at a temperature of 255-260°F. Cost of the application is said to be about a quarter of a cent per square foot.

Demand for large-size crucibles especially by the die-casting industry has resulted in a process that is said to permit the Electro Refractories & Abrasives Corporation to manufacture carbon-bonded silicon-carbide pots of exceptional capacity. The biggest previously made by the company held 400 pounds of aluminum; today it is producing crucibles that take 1100 pounds. In the case of heavier metals such as brass and copper alloys the capacity is proportionately greater, of course.

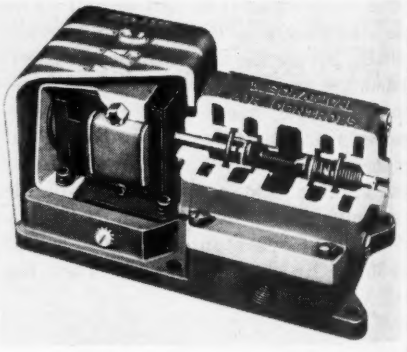
A fluorescent lighting fixture that can be used with safety in the presence of explosive gases or vapors or combustible dusts has recently been introduced by Crouse-Hinds Company. It is housed in a heat-resistant glass tube the ends of which are reverse tapered and sealed into a cast-aluminum housing that also



contains the lamp receptacle. Fixtures can be placed end to end on close centers by a link member that permits the relamping end to be lowered several inches without interfering with the adjacent fixture. Tools are not required to release the lamp receptacle and mounting-plate assembly, which is locked into the housing by a bayonet joint.

For industrial exhaust or blower systems, Flexible Tubing Company is offering relatively smooth-bore tubing that is constructed to insure minimum reduction in cross-sectional area at bends. It is made of spirally wound rust-resistant wire and is covered with a woven fabric coated with a tough resinous compound. Known as Flex-flyte Green Label tubing, it is said to resist oils, acids, alkalies, gases and flame and to possess good aging qualities. It is available in lengths up to 50 feet and in diameters from 1 inch to 2½ inches in ½-inch increments.

The basic feature of an improved type of solenoid-operated air valve announced by Mechanical Air Controls, Inc., is a surface-hardened spool of aluminum alloy onto which the sealing material is molded and bonded. The spool enters

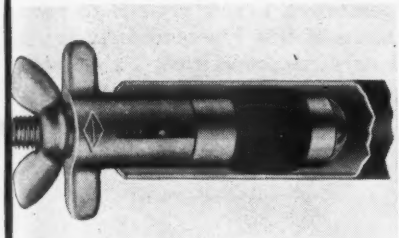


the precision-finished bores of the "bearingized" valve body and retainers and is said to effect instantaneous and positive air-pressure closure. This is the valve's only moving part, which is easily reached for servicing by removing the retainers. Each valve in the series has a full pipe orifice for maximum straight-through flow.

Wire rope for oil- and gas-well drilling is being manufactured by Jones & Laughlin Steel Corporation with a plastic core which, unlike the conventional type, will not be affected by the acids, caustics and other substances to which it is exposed in service. Furthermore, the plastic is said to retain its resiliency through-

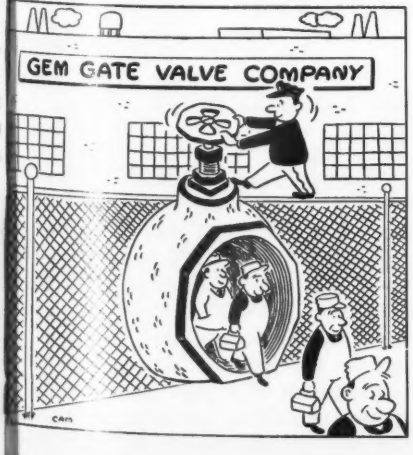
t continued application, and neither sufficient moisture during storage nor excessive moisture during use will cause mage. The rope is available in varying diameters from ⅜ inch up and with res surrounded by from three to eight eel strands.

It is sometimes desirable or necessary mporarily to close the end of a tube rrying a liquid or gas, and for that rpose The Imperial Brass Manufacring Company has provided a handy ug with a wing nut at one end and synthetic-rubber section at the other. hen the nut is tightened, the elastic ement expands and seals the tube. The lugs are available in five sizes from



¼ to ¾ inch, outside diameter, and ake it possible to test tubing installations before they are put in service r when trouble shooting for leaks. They re said to remain in place against a aximum pressure of 100 psi and can e used with all fluids except those that amage synthetic rubber.

Something unique in storage shelters r heavy machinery, dies, patterns, etc., hich, more often than otherwise, are ut outdoors for lack of space under over, is being offered by The Joe Martin ompany, Inc., manufacturer of industrial furnaces, which developed the metl housing for its own use. The structure, named Yard-Stor, looks much like Quonset hut, but with these important ifferences: It is built in sections that ay be tilted from either side to permit ccess other than through end doors, id apart, telescoped or nested. For ermanent storage, they are track-mounted, but for temporary use may



be set on the ground or on timbers. At the Martin plant, finished furnaces weighing up to 50 tons are put out in the yard and the sections are simply lowered over them as needed. There are many applications for this new type of shelter in the agricultural, industrial and construction fields not only for the storage of materials and equipment but also to protect men at work.

An air control for engine and turret lathes handling bar stock up to 1 inch in diameter has been designed to serve as a substitute for hand levers and wheels for closing and opening collets—clamps that hold the work during machining. Named Wilson Air Collet Closer, it operates on a new principle for mechanisms of this type and features a stationary neoprene inner tube which,

when inflated with compressed air, closes the collet and, when pressure is released, opens it. Rings, pistons and packing are eliminated, and the use of a finger-tip- or foot-actuated valve that lessens fatigue increases production. The device is also said to prevent air leakage and slippage; to insure consistent accuracy through controlled holding pressure and to adjust itself automatically with variations in size of stock or machined parts. The Collet Closer is being distributed by Durable Products.

QUOTES

—FROM HERE AND THERE

Air Agitation Helps to Cool Water

"Applying air to circulate water being cooled in a tank has several advantages," according to J. C. Monk, chief engineer, Golden State Company, Ltd., Los Banos, Calif. "In our plant, water for washing cottage cheese curd is cooled and stored in an 1800-gal. insulated tank. Air to agitate the water is admitted through perforations in a pipe located beneath a direct expansion ammonia coil supplying the refrigeration. Air movement

aintains flow of water around coils. "Heat transfer from air to water is s than that encountered when me- anical agitation is used. However, culation of water by air bubbling up st ammonia coil is adequate to bring nk contents down to 33 deg. F. with fficient speed to supply our needs. his is accomplished without insulating ils by freezing water on them."

Food Engineering, July, 1953

lastic Balls Save Crude Oil

"Tiny plastic balls floating on top of ude oil stored in huge refinery tanks ve cut evaporation losses appreciably. he nitrogen-filled 'microballoons' are st-size and form a blanket of foam at rises and falls with tank levels, vir- ally cutting off contact with the air. illions of the tiny plastic balls are ixed with crude oil as it is piped into he tank, or are spread on the oil in he tank."

etroleum Newsnotes July-August, 1953

lumina from Low-grade Ores

"A continuous process for producing gh purity alumina from low grade do- estic ores is ready to be licensed by obeth Corp., Chicago, after more than year's operation in a European pilot ant. The continuous process recovers to 100 percent of all reagents used. perations purposely used low grade ka- in clay (10 percent alumina and 80 lica) to prove the ability of the process handle impurities. Preliminary cost timates are said to indicate that 99.9 rcent alumina can be produced at 15 20 percent less than from bauxite th the Bayer process. Electrical re- irements are less than 2 kwh per und."

Steel, June 1, 1953

"Alfred, what a terrible thing to call a branch!"

Industrial Literature

More than 800 pieces of apparatus and equipment for testing soils, concrete and bituminous materials on an engineering basis are described and illustrated in a 72-page catalogue—No. 53—issued by Soiltest, Inc., 4520 W. North Avenue, Chicago 39, Ill.

Preliminary Machining Recommendations for Titanium is the title of a booklet released by Mallory-Sharon Titanium Corporation, Niles, Ohio. It is based on detailed studies of machining operations, and users of the metal should find the information very helpful.

A 506-page catalogue on the complete Lunkenheimer line of valves and other products is now available and copies can be reserved for distribution by the firm's sales representatives and distributors. Requests should be sent to The Lunkenheimer Company, P. O. Box 360, Annex Station, Cincinnati 14, Ohio. Useful features of the book is a 24-page valve-selector guide and more than 100 pages of reference data.

Ingersoll-Rand Company has recently published a bulletin on its Class CNTA multistage centrifugal pumps designed specifically for boiler-feed, refinery, processing and mine services and available for 300-1000 psi pressures and in capacities up to 700 gpm. Of eighteen pages, it includes sectional drawings and installation views, as well as a 2-page chart showing the unusual interchangeability of parts throughout the line. Ask for Form 7251 wh writing to the company's main office, Broadway, New York 4, N. Y., or one its branches.

Catalogue No. 200, obtainable witho cost from Titeflex, Inc., 500 Frelinghuys Avenue, Newark 5, N. J., deals comp hensively with its metal hose and fittin Of 48 pages, it also contains charts givi frictional losses versus flow rates and formation of aid in ordering hose.

Welded floats of stainless steel, mo and chrome, cadmium- or copper-plat steel for many services are described in B letin No. 753 being distributed by W. Nicholson & Company, 12 Oregon Stre Wilkes-Barre, Pa. Information includ buoyancy data and available shapes a sizes.

The uses and advantages of B. F. Goo rich Cutless Rubber Bearings for industr equipment, in which they are submerg or lubricated with the liquid handled, a dealt with in a catalogue obtainable fr Lucian Q. Moffitt, Inc., 333 S. Main Stre Akron, Ohio, national distributor of t bearings.

A bulletin containing the results of tes made by York Laboratories of Stamfor Conn., of different types of silicone wat repellents for masonry walls is being offer by L. Sonneborn Sons, Inc., 404 Four Avenue, New York 16, N. Y. Inquiri should be sent to Department P-6, Buildi Products Division.

An illustrated bulletin describing She Speed soluble oil is obtainable from She Speed Chemical Products Division, Mic igan Tool Company, 7125 E. McNich Road, Detroit 12, Mich. A multiviscos blend, the coolant-lubricant is suitable both light and heavy metal-cutting, gri ing and forming operations. Ask for B letin 5053.

An improved electronic adjustable-spe drive from ¾ to 3 hp to power small dustrial equipment in place of mechani gear boxes, clutches and variable-pitch co pulleys is described and illustrated in booklet offered by Reliance Electric & E gineering Company, 1111 Ivanhoe Roa Cleveland 10, Ohio. Write for Bulle D-2102.

Niagara Machine & Tool Works, 637-6 Northland Avenue, Buffalo 11, N. Y., h announced the availability of Bulletin 58 illustrating and describing its line of indi able presses designed for light- to mediu tonnage work and equipped with mecha ical sleeve clutches. Well illustrated, t 24-page book also gives full informati about accessories such as a pneumatic tri ping device for the clutch, air releasing bra for automatic feed, and pneumatic die cus ions for drawing operations.

Froth Flotation, Industry and Chemical A plications, is the subject of a bulletin tainable from Denver Equipment Compa Box 5268, Denver 17, Colo. Written L. A. Roe, technical supervisor, Divisi of Ore Research, Jones & Laughlin Ste Corporation, it discusses, among oth things, the separation of near colloidal-s particles from saturated brine; fractionat of fine clays; recovery of fossil resin fr coal; and cleaning peas and wheat. A suggests potential uses such as the recove of oil and greases from machine operati and from steel and petroleum-refini wastes; purification of industrial sludge a waste waters, etc.